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DEVOTED TO THE INTERESTS OF TEXTILE CHEMISTRY
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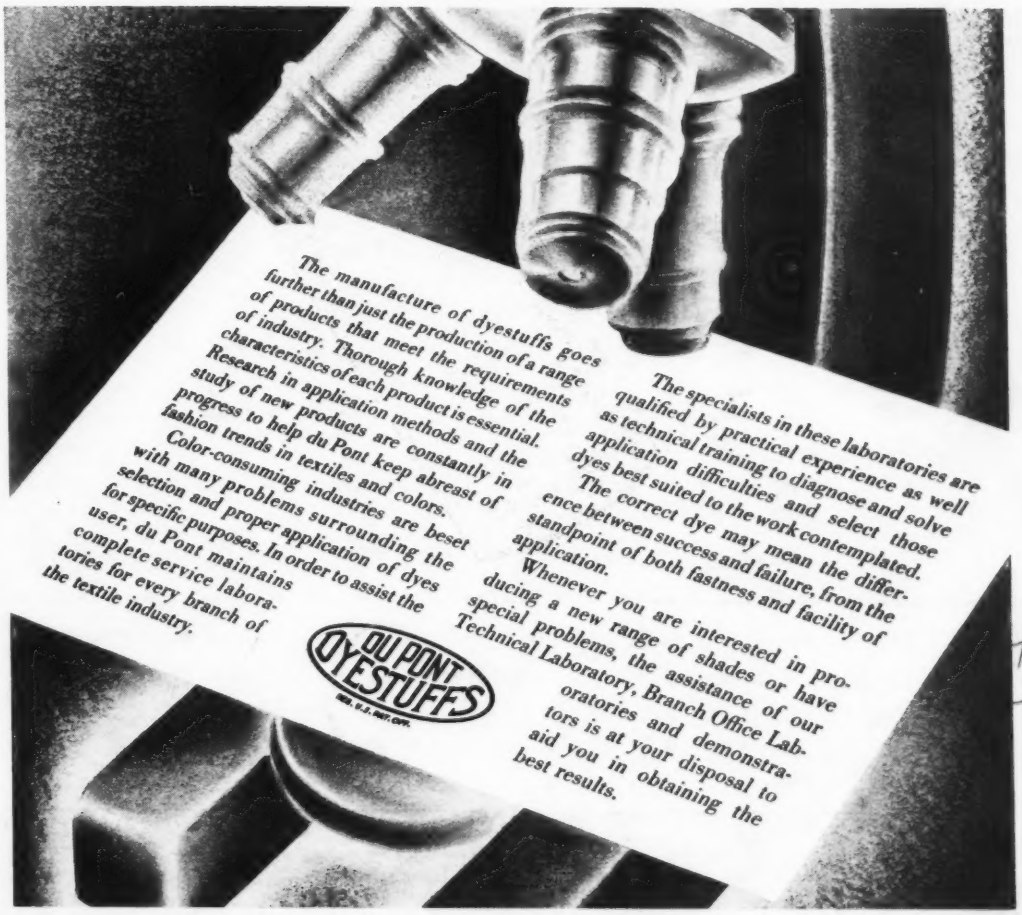
VOLUME 26 | MAY 31, 1937 | NUMBER 11

DU PONT TECHNICAL SERVICE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Official Publication of the American Association of Textile Chemists and Colorists

THE OBJECTS OF THIS ASSOCIATION ARE:

"To promote increase of knowledge of the application of dyes and chemicals in the Textile Industry.

"To encourage in any practicable ways research work on chemical processes and materials of importance to the Textile Industry.

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AMERICAN
DYESTUFF REPORTER

VOLUME 26 MAY 31, 1937 NUMBER 11

Fluorescence

*Fluorescent Intermediates and Synthetic Organic Colors**

Translated by P. J. WOOD

VARIOUS TYPES OF PHOTOLUMINESCENCE

LUMINESCENCE is the name generally given to all those luminous emissions which are not of purely thermal origin.

Luminescence produced by means of excitation by ultra-violet, visible or infra-red rays is known as photoluminescence. Photoluminescence which ceases practically immediately after the luminous excitation is called Fluorescence. On the other hand, if the luminescence is apparent for some time after removal of the exciting cause, the phenomenon is called phosphorescence. We shall see that these definitions are insufficient and that they will have to be modified.

There are two principal types of fluorescence; optical resonance and fluorescence with change of frequency which is true fluorescence.

Optical resonance, observed in monatomic gases, such as metallic vapors, is characterized by a re-emission of monochromatic light having the same frequency as the exciting radiation. Other lights are practically without effect.

There exists an almost complete independence of phase between the exciting light and the emitted radiation; the latter is, moreover, very sensitive, particularly as regards its polarisation, to the influence of electric or magnetic fields acting on the excited monatomic vapor. Optical resonance is, therefore, not simply intense selective diffusion, since, in the case of diffused light, there always exists a close relation of phase between incident radiation and secondary radiation. Besides, electric and magnetic fields have practically no action upon diffused light.

The RAMAN effect, or diffusion with change of frequency, is easily distinguished from fluorescence. In the RAMAN effect, it is the variation of frequency which is determined by the surroundings, while, in fluorescence, the spectrum of the emitted radiations is solely characteristic of the substance irradiated. Only certain radiations are capable of producing fluorescence in a particular substance, whereas the RAMAN effect is not selective. Diffusion with change of frequency is a phenomenon always less intense than certain cases of fluorescence.

In fluorescence with change of frequency or true fluorescence, the spectral composition of the emitted light is different from that of the exciting light, showing a strong band of absorption of the irradiated substance. The light of fluorescence may contain some radiations not present in the exciting light. The mean frequency of the emitted radiations is always inferior to that of the radiations capable of producing fluorescence (Stokes' Law). However, the minimum frequency of excitation being, in general, a little lower than the maximum frequency of emission, a part of the light of fluorescence may have a frequency slightly higher than the exciting light, when this is suitably chosen. But the proportion of light given out with increase of frequency is quite small compared with the total light of fluorescence.

For example, the fluorescence, often very intense, of the solutions of some dye-stuffs is produced by radiations whose wave lengths are contained in a space of some hundreds of angstroms which correspond to an intense band of absorption of the dyestuff. The spectrum of the light of fluorescence extends in a continuous manner over a comparable space. The maxima of absorption and emission are quite close (about 200 Angstrom) and the two bands lie approximately one on the other. With regard to dyed fabrics, M. R. Toussaint has found that the maxima of the bands of absorption and emission were about 1,000 Angstrom units apart. However, we shall see that the exciting radiations may be much further away from the emitted radiations. The band of absorption is always cut off sharply towards the long wave lengths and fades out more gradually towards the short wave lengths; on the contrary, the band of emission diminishes rapidly on the side of the shorter wave lengths.

These characteristics of fluorescence show a certain independence of absorption and emission which appear like two phenomena, successive and not simultaneous. Be-

*A paper delivered before the French Society of Electricians June 25, 1935 by M. Pierre Mougeot, chemist, Kuhlmann Co.

tween these two phenomena, the luminous energy must be located during an appreciable period in the fluorescent molecules or atoms.

Experiment has conclusively proved that fluorescence has a certain persistence. The distinction between phosphorescence and fluorescence, based on the duration of the phenomenon, becomes less clearly defined since it depends solely on the degree of persistence. It is therefore necessary to distinguish these phenomena by means of other critera, such as, for example, the influence of temperature (M. Jean Perrin). In the case of phosphorence, the duration of emission is increased indefinitely when the temperature is lowered; the luminous energy absorbed can then be stored indefinitely in the medium; but it can be quickly liberated by a rapid rise of temperature (thermoluminescence). On the other hand, the period of emission of ordinary fluorescence is extremely short, even in the neighborhood of absolute zero.

Since in phosphorescence, the period of emission increases indefinitely when the thermic energy tends toward zero, it seems that the luminous emission is not spontaneous, but that it requires a certain expenditure of energy. On the contrary, the emission of light from a fluorescent body must be a spontaneous phenomenon, little affected by outside influences and not requiring the expenditure of any appreciable amount of energy.

The spontaneity of the luminous emission is one of the most essential characteristics of true fluorescence.

Direct Measurement of the Period of Fluorescence

E. Becquerel was the first to try to measure the period of fluorescence using his phosphoroscope with turning sectors. He succeeded in observing for a large number of solid substances, feeble emissions lasting some thousandths or some hundredths of seconds. But, although he used an apparatus permitting observations of periods as small as 1/50,000th of a second, he was not able to observe any persistence of emission in the case of fluorescent liquids. In the case of solids he succeeded in measuring the duration of emission of uranyl salts, (about 10^{-3} second) and of the ruby (about 10^{-2} second). All other trials proved fruitless.

Later, R. W. Wood, by placing a thread of the fluorescent substance on a rapidly rotating disc illuminated always from the same point by synchronous electric sparks, was able to measure periods of emission as low as 1/160,000th of a second for crystallized anthracene and 1/400,000th of a second for barium platino-cyanide. A study of fluorescent liquids accomplished by throwing the image of a luminous source having sharply defined edges onto a jet of the liquid moving at a very high velocity, proved that, in this case, the periods of emission were less than $0{,}5.10^{-7}$ of a second.

For gases, the study of high speed jets in the same way led to the conclusion that optical resonances generally have a period of emission less than 10^{-6} of a second.

The study of the polarization of the lights of resonance and fluorescence and its variations (M. F. Perrin) shows for the first time indirect proof of the existence of persistence of emission and provides a method of calculation of its duration. Values between 10^{-8} and 10^{-7} of a second have been obtained for atomic vapors and between 10^{-9} and 10^{-8} of a second for fluorescent dyestuffs in solution.

About the same time, E. Gaviola developed a method derived from the method of Abraham-Lemoine which gives equally short emission measurements. The values obtained in this way are, generally, in close accord with those resulting from the study of polarization.

The first results obtained by these methods for the optical resonances and dye-stuff solutions are almost all in agreement, and very close to the values calculated according to the classic electromagnetic theory. There seemed to exist a sharp distinction between the short fluorescences and photoluminescences of much longer duration, exhibited, it was believed, only by solid bodies and which were placed in the category of phosphorescences. However, using the method of calculation based on the study of polarization, M. Francis Perrin has shown that certain fluorescent organic solutions (for example the solutions of quinine and anthracene) show persistence of emission 10 to 50 times longer than those primitively measured on dye-stuff solutions. These types of luminescence show, on the other hand, all the characteristics of true fluorescence. All the same, the longer luminescence of uranyl salts have a group of characteristics which brings them very close to fluorescence. The fluorescence of these bodies is more persistent than certain short types of phosphorescence.

M. F. Perrin has also shown that the solid state plays no essential role in the magnitude of the duration of the fluorescence of uranyl salts. As a matter of fact, there are some solutions of uranyl sulfate which have a persistence of emission very little different from that of the crystallized sulfate.

As we have already seen, it is not possible, without being arbitrary, to distinguish between fluorescence and phosphorescence according to the period of duration of the emission.

Theories of Fluorescence

As a matter of fact, undulatory mechanics, alone gives a coherent interpretation of the absorption and emission of light by the molecules. However, the more familiar conceptions of the classic electro-magnetism and the quantum theory to which we will confine ourselves here, suffice to render account of the principal characteristics of fluorescence. They furnish a sufficiently satisfactory approximation and prepare the way for an understanding of the quantum wave theory.

(1) *Electromagnetic theory*:

In each atom of a fluorescent body there is supposed to exist an electric oscillator. When such an oscillator comes under the influence of electromagnetic waves of its own frequency or extremely near to its own frequency v, its oscillation is greatly amplified. The duration of

establishment of a stationary regime being relatively great, these oscillations follow practically not at all the variations of phase of the incident wave. If these waves were strictly monochromatic, one could show that, on account of the DOPPLER effect due to thermic agitation, all the differences of phase between 0 and π would be detected. The resonance of the oscillators being produced with almost no relation to the phase of the incident waves, nor to each other, the emitted waves cannot interfere and produce in all directions a strong luminous re-emission, independent of fluctuations in density and practically without relation of phase with the incident waves.

This theory makes possible the calculation of the average period required to completely diffuse the energy stored by each resonator when the exciting light is suddenly removed. The resuks obtained (for example, when $\nu = 6.10^{14}$ corresponding to the middle of the spectrum, $1{,}11.10^{-8}$ seconds in air and $0{,}83.10^{-8}$ in water having index $n = 1{,}33$) are in sufficiently good accord with the duration of emission of optical resonances and certain types of fluorescence but they are in complete discord with the periods of emission of a great number of fluorescent bodies.

The electromagnetic theory has therefore been developed with a certain degree of success to explain optical resonance, but it has shown itself entirely insufficient to interpret cases of true fluorescence as it explains neither the change of frequency nor the photochemical reactions which often accompany this phenomenon. The classic electromagnetic theory, as a matter of fact, cannot be applied to a system which possesses two groups of frequencies, one for absorption, the other for emission.

(2) *The quantum theory*:

These differences of frequency can only be understood if the molecules assume different states, now of absorption now of emission, as they cannot absorb and emit simultaneously. The absorption of light must transform the molecule from its ordinary state into a state of emission. However, this state cannot depend on the intensity of the exciting light, since the spectrum of the emission is different. It is sharply distinct from the ordinary state and the intensity of excitation can only change the number of molecules transformed. These molecules thus transformed return to their ordinary state again, probably through the same act of emission, since, under certain conditions, fluorescence may continue for an indefinite period without any loss of the fluorescent material.

It is, therefore, necessary to introduce a quantum theory of fluorescence which explains the absorption and re-emission of light by the intermittent transformation of the molecules between two definite states of varying internal energy.

Activated state—In order to explain the very great thermic acceleration of reactions, Arrhenius, in chemical kinetics, has suggested the existence of *activated* molecules possessing a large excess of internal energy w_a, in comparison with ordinary molecules. These molecules *a* must be instable and susceptible of changing back again spontaneously into the normal form A, when they lose their excess of energy, otherwise they would constitute a distinct chemical species, isomeric, which one would be able to separate at low temperatures. In an isolated system in a state of equilibrium, the energy for activation can only be created by molecular agitation or by isothermic radiation. The state of affairs established may be determined, no matter what may be the mechanisms put in play, by the law of MAXWELL-BLOTZMANN, as shown by the equation

$$\frac{c_a}{c_A} = g\,\epsilon^{-\frac{w_a}{kT}},$$

c_a representing the concentration of the activated form a, c_A the concentration of the normal form A, g the proportion of probabilities *a priori* of the states *a* and *A* and *T* the absolute temperature.

It seems that the passage of the molecule from one state to the other takes place suddenly with instantaneous absorption or emission of all the energy.

The quantic transformations of activation or disactivation should be effected by means of the electromagnetic radiation of light in the broad sense of the phrase. However, it is the only way in which these variations of energy in the molecules of rarified gases could be produced.

The characteristics of fluorescence lead us to suppose that this phenomenon is the result of successive absorption and emission associated with molecular metamorphoses between the normal state and the activated state. The molecules of fluorescent bodies are practically all in a normal state in isothermic equilibrium at ordinary temperature. But when one submits them to radiation of the proper frequency, they have at any moment a certain probability of passing quickly into a state of activity while suddenly absorbing the necessary energy. A molecule thus activated is practically insensible to incident radiation, but it can, at any moment, return spontaneously to its normal state while liberating, in the form of light, the energy absorbed during its activation.

The average period which elapses between the absorption and the re-emission of light is called the average life of a molecule in the activated state. We shall see later in the laws of fluorescence that the intensity of the emitted light is nearly always proportionate to the intensity of the activating light. The average life of molecules in the activated state must be very short because, even with intense illumination, the proportion of activated molecules remains small.

The considerable amount of reserve energy stored in an activated molecule (of the order of 60,000 calories in the case of fluorescence falling within the visible spectrum), whose magnitude is independent of the illumination, explains why photochemical and endothermic reactions are often associated with phenomena of fluorescence. For example, nearly all fluorescent bodies are destroyed by light in the presence of oxidizing compounds (oxygen, etc.) or reducing agents (alcohol, etc.). The degradation

of dyed colors on exposure to light is thus explained in a very satisfactory manner.

Before stating precisely the quantic mechanism of fluorescence and phosphorescence, I would remind you that Planck and Einstein have shown in the isothermic theory that matter cannot absorb or emit luminous energy following a continuous process and that, for a given frequency v, the exchanges of energy between the matter and the radiation ought to be per indivisible quanta of magnitude hv, h being a universal constant. Moreover, since an atomic system passes from one state to another by absorption or emission of light, the frequency v of the light put in play is determined in function of the variation of internal energy w by the formula

$$v = \frac{w}{h}$$

Further, the study of the photoelectric effect for example proves that the radiation itself ought to be considered from the energy producing point of view as discontinuous and formed of projecticles or photons of energy $h\nu$ having the quantity of movement $\frac{h\nu}{c}$.

Optic resonances.— The relation $v = \frac{w}{h}$ shows that during the two strictly inverse transformations of activation and disactivation between two definite states A and a, the frequency of the absorbed light and the emitted light should be identical. This mechanism satisfactorily explains optic resonances.

The diagram (Fig. 1), due to M. M. J. and F. Perrin, illustrates this phenomenon graphically, the internal energy being carried on the ordinate and the time on the abscissa. The atom from time to time undergoes a temporary transformation a by absorption of one photon or quantum of light having the frequency v, afterwards it returns to its normal state A after an average life T with re-emission of one photon of light of the same frequency.

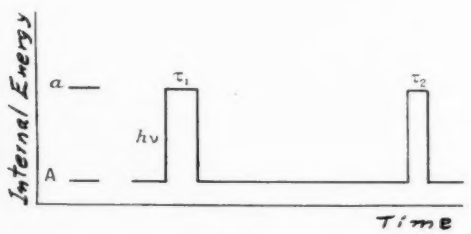

Fig. 1

Fluorescence with change of frequency.—This simple mechanism does not explain the change of frequency observable in the case of true fluorescence. But the variation of frequency is very easy to interpret.

The electronic transformation which provokes the activation or disactivation of the molecule ought to have influence on the bonding forces and, consequently, should modify the relative positions of equilibrium of the atoms in the molecule. The electronic transformation should be produced very suddenly even although the atoms, much more inert than the electron, have not time to be displaced to any appreciable extent. There results an oscillating movement of the molecule which in the case of solutions, is almost instantaneously deadened while communicating with neighboring molecules of the solvent and producing a very slight local rise in temperature. These states of oscillation, instead of being well quantified and forming a discontinuous series, will generally give, on the contrary, an entirely continuous series as a result of the interaction with neighboring molecules. This lack of quantification of the oscillating states explains the band structure of the spectra of fluorescence. However, one finds occasionally a trace of quantification of the molecular oscillations in a structure more or less accented by these bands. For example, the salts of uranyl give bands of absorption and emission constituted by a series of quite narrow channels, regularly spaced, the differences of frequency being respectively equal to the frequency of oscillation of the radical (UO^2).

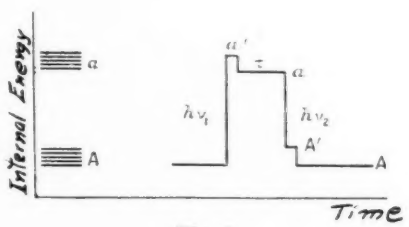

Fig. 2

MM. J. and F. Perrin have proposed this diagram (Fig. 2) to explain the phenomena of fluorescence. As in Fig. 1, the time is carried on the abscissa and the internal energy on the ordinate. The relations can be expressed as follows:

$$A + h\nu_1 \rightarrow a' \qquad \text{absorption,}$$
$$a' \rightarrow a + \varepsilon_1,$$

average life T, in state a:

$$a \rightarrow A' + h\nu_2 \qquad \text{emission,}$$
$$A' \rightarrow A + \varepsilon_2$$
$$\text{with } h\nu_1 - h\nu_2 = \varepsilon_1 + \varepsilon_2;$$

the quantities ε_1 and ε_2 representing the energy of oscillation of molecules a' and A' dissipated in the form of heat.

Phosphorescence.—An activated molecule a may at times undergo, sometimes spontaneously, sometimes by reaction with other molecules, a transformation bringing it into a metastable state α or even a completely stable state from which the return to the normal state A is only possible while repassing by a state analogous to a of internal energy slightly superior to that of the molecule α. Such a molecule will remain in the state α until some external cause, shock or radiation furnishes it the necessary energy ε for its return to its primary activated state. If this

energy is not too great, it may be furnished by the thermic agitation of the medium. The mean interval separating the absorption of the activating light and the luminous emission will depend principally on the rapidity with which the medium furnishes the energy ε to the molecule α. This mechanism, which satisfactorily explains the phenomena of phosphorescence is represented by MM. J. and F. Perrin by means of the diagram (Fig. 3) where, in order to simplify it, we have not made the states of oscillation to intervene.

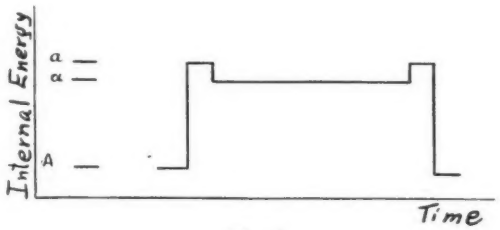

Fig. 3

LAWS AND PRINCIPAL CHARACTERISTICS OF FLUORESCENCE

Stokes' Law—Influence of Temperature

The mean frequency of the emitted radiations is always inferior to that of the exciting radiations (Stokes, 1852). However, at the ordinary temperature, the band of absorption and the band of emission encroach a little on one another (Antistokes fluorescences).

The proportion of light emitted with a frequency superior to that of the exciting light is always slight at ordinary temperature, but increases when the temperature rises.

This phenomenon is easily explained. At a very low temperature the thermic agitation of the medium is negligible in proportion to the molecular oscillations produced by the exciting radiation. On the contrary, at a higher temperature, a certain proportion of the molecules of the fluorescent body will be found in the first state of oscillation A', this proportion being determined by the law of Maxwell-Boltzmann. These molecules will thus be able to pass into the state of electronic activation while absorbing less energy than the non-oscillating molecules and there will result a spreading out of the band of absorption toward the lower frequencies. Reasoning by analogy would show us that the band of emission will spread out toward the high frequencies. The curves (Fig. 4) show the relative positions of the bands of absorption and emission at absolute zero and at any other temperature. At a very high temperature, the bands of absorption and emission would be almost identical.

Disactivation Without Emission—Luminous Yield

As the number of photons emitted is often much smaller than the number of those absorbed, the activated molecules ought to be able to return to the normal state, without luminous emission, by liberating the available energy in kinetic form.

We call *luminous yield p* of a fluorescence the proportion of the number of photons emitted to the number absorbed.

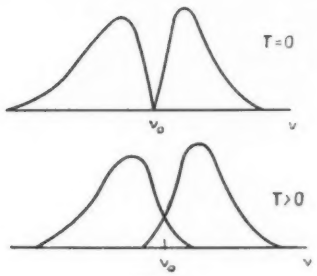

Fig. 4

By reason of the difference of frequency between the bands of absorption and emission, this luminous yield is a little superior to the yield of energy, but this latter depends on the frequency of the exciting light. The determination experimentally of these yields is laborious and not very accurate; the luminous yield of fluoresceine in aqueous solution may be in the neighborhood of 1, but other solutions of coloring matters, generally speaking, have not such good yields. A colored substance on which one observes no fluorescence ought to have a luminous yield less than 1/10,000th. We will study further the effect of concentration and of the addition of certain bodies on the luminous yield of fluorescence.

If one designates by T the mean life of the activated molecules when there exist cause of disactivation without luminous emission and by T' the mean life of the activated molecules if the causes of disactivation without luminous emission are not present, theoretical consideration will show that

$$T = pT_0.$$

Knoblauch's Law

Knoblauch has shown, by varying the intensity of the exciting light in the proportion of 1 to 6000, that in all intense fluorescences and in the majority of weak fluorescences, the intensity of the emitted radiations is proportional to the intensity of the exciting light.

More recently, Wood has discovered weak fluorescences of which the intensity is proportional to the square or to the cube of the intensity of the exciting light.

Optimum Concentration of Fluorescent Solutions

The study of the fluorescence of solutions, for one thickness and one exciting light, shows that fluorescence arrives at a maximum for one concentration called the optimum concentration (Fig. 5).

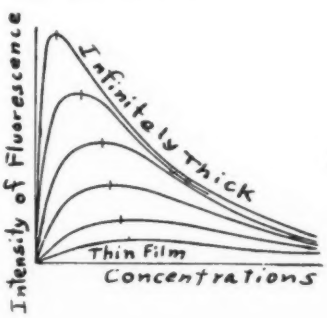

Fig. 5

The optimum concentration varies with the thickness of the solution. It increases as the thickness diminishes and seems to tend towards a limit when the thickness becomes less than one micron. This limit is of the order of some thousandths for fluoresceine. Simultaneously, the value of the maximum emission decreases and tends towards zero. If, on the contrary the thickness increases indefinitely, the optimum concentration diminishes and could drop beyond all limit if the solvent were perfectly transparent. For a thickness of one centimeter, the optimum concentration is some hundred thousandths for solutions of fluoresceine.

Exponential Decrease of Fluorescent Power

M. J. Perrin has deduced from these observations that the specific fluorescent power Φ in proportion to unity of mass of the dissolved substance decreases indefinitely as the concentration increases.

M. F. Perrin has shown that this decrease follows approximately the following exponential law:

$$\Phi = \Phi_0 e^{-kc}$$

c representing the concentration. The coefficient k has a simple physical signification. It is equal to the inverse of the concentration c_m which is optimum for an infinitely thin cell.

$$c_m = \frac{1}{k}$$

Knowing the specific fluorescent power Φ, one deduces from it directly the value of the fluorescent power $\mathcal{F}$ in proportion to the volume of the solution

$$\mathcal{F} = c\,\Phi = \Phi_0 c e^{-kc}$$

S. J. Wawilow has shown that there occurs an anomaly in the case of weak solutions and that the decrease of specific fluorescent power is better expressed by the relations

$$\Phi = \Phi_0 e^{-k(c-c_0)} \quad \text{for } c \geq c_0$$

and

$$\Phi = \Phi_0 \quad \text{for } c < c_0$$

This correction is generally of little importance.

Maximum Fluorescence of Dyed Shades

M. R. Toussaint has shown, in studying by means of the photocolorimeter the variation of fluorescence of dyeings in function of the degree of light-dark or medium tone, that the luminescence comes to a maximum at a medium tone which he called *critical*. This optimum of fluorescence corresponds to the maximum purity of the color, that is to say, to the maximum variation of its curve between the "complementary" (maximum of absorption) and the apparent dominant.

Molecular Induction

The variation of fluorescent power of a body with its concentration has led us to admit the experimental reality of disactivation without luminous emission by non-elastic shock of the "second species." In reality, this phenomenon is not due to an impact between a certain activated molecule a and an ordinary molecule A. The disactivation is produced at some distances so great that the circuit of the spheres of impact is met with at relatively great distances (several Angstrom units). Finally, it is necessary, in order that the disactivation may not be luminous, that the molecules may be able to disperse violently, as is the case in the liquid state. For example, fairly strong solutions of esculine in glycerine are dark at ordinary temperatures, but in the solid state, when frozen by means of liquid air, they are strongly fluorescent. It is the same in the case of phenanthrene; in the liquid state it is dark (non-luminous), solid, at the melting point, it is very fluorescent and it is still more so at the temperature of liquid air because the crystals are harder.

These disactivations by molecular induction may be compared with the following mechanism: when an oscillating electric circuit is excited in the neighborhood of a synchronous circuit, an induced current is set up in the latter by resonance and the two circuits repel each other with absorption of energy.

Molecular induction is always produced between "synchronous circuits"; we have, for instance, no indication of disactivation by reaction of a dissolved molecule of coloring matter and a molecule of solvent. But the two synchronous circuits may not be identical: a molecule is synchronous with another when it absorbs the same light; thus it is that an activated molecule a may be disactivated without emission of light, by the approach of a molecule B which may be chemically very different, but which may absorb an amount of energy equal or nearly equal to the amount required to activate molecule A. Experience shows us that Methylene Blue whose band of absorption coincides exactly with the band of emission of Fluorescent Blue is a disactivant of the latter more powerful than Fluorescent Blue itself. The same phenomenon is observed in the case of Eosine and Fluoresceine, and Rhodamine and potassium permanganate.

Inhibitors of Fluorescence—Forced Induction

The addition of certain entirely colorless substances having a band of absorption nowhere near that of the fluorescent body may diminish the fluorescent power considerably or even destroy it altogether. This property of stifling the most diverse cases of fluorescence is shown by iodides, sulfides, sulfocyanides, hydrosulfites, etc., whereas the sulfates and nitrates have no action. The chlorides and bromides are slightly active or entirely inactive in alkaline solution, but act strongly in acid solution (on quinine for example). In the same way, certain classes of organic compounds such as the phenols, nucleary amines, are powerful inhibitors of fluorescence. All these bodies act without chemical modification of the fluorescent substances, the curve of absorption is not modified. The common characteristic of the inhibitors of fluorescence is the property of being easily oxidizable, that is to say, having the facility of parting with an electron. When an activated molecule finds itself in the vicinity of a molecule of one of these inhibitors, it has a strong probability of becoming disactivated while taking away the lightly held electron, throwing out kinetic energy equal

to the energy of activation less the energy of ionization of the disactivating molecule.

This method of disactivation is only produced when the energy of activation is greater than the energy of ionization of the disactivating molecules under consideration. For example, nitrobenzene in the neutral state strongly inhibits the fluorescences corresponding to a mean frequency greater than that of yellow light, whereas it is entirely without action on the fluorescences corresponding to mean frequencies below this limit, for example, on the red fluorescences of "fluorescent blue" and chlorophyl. Relative to induction by resonance which we have met with previously, this new type of molecular induction can be compared with the putting in vibration of a harmonic sheet by any sonorous chord.

Transfer of Activation Between Different Molecules

The transfer of activation or "shock of the third species" which can be produced between molecules of the same chemical species may also be effected between different molecules having the same energy of activation; it is produced even if the energy of activation of the second molecule is a little less than the available energy in the activated molecule, the difference between these energies being transformed, in that case, into kinetic energy.

The "sensitized fluorescences" of J. Frank and G. Cario correspond to this phenomenon. For example, if one excites mercury vapor in the presence of thallium, one observes the green ray of resonance of the thallium.

Internal Conversion of Activation
Internal Sensitized Fluorescences

It is likely that the majority of the mechanisms of disactivation by reaction between two molecules may be equally well produced between two parts of the activated molecule itself. The disactivation is produced by internal conversion of the energy of activation into energy of oscillation or into energy of ionization. This phenomenon explains the difference of yield of fluorescence between Fluoresceine and Erythrosine (tetra iodo fluoresceine). The I ions which are found in this latter substance disactivate the molecule by autoionization as soon as they become activated.

The transfer of activation may be equally well produced in the interior of a single molecule and provokes *internal sensitized fluorescence*. Examples of this latter phenomenon are very numerous and occupy a very important place in practical applications of fluorescence, since it allows us to excite blue, green, orange, yellow or red fluorescences by means of ultra-violet rays, now invisible to the eye. Thus the greenish yellow fluorescences of Auramine NO and Methylene Yellow N and the reddish orange fluorescences of Rhodamine N6J and Rhodamine NB excited by the Wood light, are internal sensitized fluorescences. The activations corresponding to the two bands of absorption probably interest two different parts of the molecule; there is instantaneously a transfer of activation from the ultra-violet "oscillator" to the blue, green, yellow or red "oscillators."

THE FLUORESCENCE OF SYNTHETIC ORGANIC COLORS AND OF THE INTERMEDIATES USED IN THEIR MANUFACTURE

M. R. Toussaint has shown that all synthetic organic coloring matters are more or less fluorescent. But the luminous emission often falls in the infra red outside the visible spectrum (particularly in the case of greens and blues).

Among the considerable number of coloring matters and intermediates actually in commerce, I will only mention those strongly fluorescent bodies whose radiations fall within the visible spectrum.

These fluorescences are susceptible of very varied practical application, particularly when one employs as the exciting light the near-ultra-violet (Wood light) which is invisible or almost so.

The intermediates and coloring matters indicated below are fluorescent in solution or when applied to the different textile fibers or paper. Certain of these products may be used for the preparation of fluorescent varnishes and paints.

The nature of the textile fiber or the use of mordants play an important role in the intensity of the fluorescence of the colors. For instance, the fluorescence of Auramine NO, Rhodamine N6J, NB, etc., disappears when these basic colors are dyed on fiber mordanted with Tannin or Depsoline N. This inhibition of the fluorescence may be due either to the chemical combination of the coloring matter and the mordant which "blocks" the activable grouping, or simply to the "anti-oxygen" properties of these mordants. The chemical combination of basic colors with mordants is demonstrated in particular by the fact that addition of Tannin or Depsoline N to solutions of these colors clearly modifies their spectra of absorption.

Principal Synthetic Organic Coloring Matters Which Are Very Fluorescent to Wood Light

Direct colors (substantive):
- Brilliant Diazol Yellow NS.
- Diazol Yellow N.
- Brilliant Diazol Yellow N5J extra.
- Diazol Yellow NJ.

Primuline N (direct dyeing):
- Primuline N (after-treated with soda).
- Primuline N (chlorinated).
- Primuline N (developer NA).

Some other colors such as Congo Red N, Diazol Light Scarlet N5B, Diazol Geranine NJ, Diazol Purpurine N9B, Diazol Purpurine N10B, Diazol Pink NR and NB, and Diazol Violet NB are rather fluorescent.

Acid colors:
- Brilliant Acid Rhodamine NB.
- Brilliant Milling Violet NB conc., and NRL.
- Fluoresceine NS.
- All brands of Eosine, Phloxine and Rose Bengal.
- Erythrosines.
- Primrose soluble in alcohol.

Basic colors:

Methylene Yellow N.
Auramine NO.
The various brands of Fast Phosphines.
Acridine Orange N.
Rhodamine N7J, N6J and NB.
Methyl Violet N bluish conc.

Certain other basic colors such as the Methylene Blues, Victoria Blues, Thionine Blue N extra and Methylene Green NB are fairly fluorescent in very dilute solutions or dyed in very light shades on natural silk.

Vat colors:

Solanthrene Yellow N2J, NJF and NJ.
Solanthrene Orange N4J and NJ.
Solane Yellow NJ and NR.

Acetoquinone colors:

Acetoquinone Orange N and NJ.
Acetoquinone Corinth N.

Among the colors not made in France, it is important to mention Fluorescent Blue which is also sold under the commercial names of Iris Blue and Resorcine Blue (ammonium salt of tetra bromo resorufine).

Principal Intermediates Which Are Very Fluorescent Under the Action of the Wood Light

Amino disulfonic acid 1-3-8.	2RL acid.
Amino acid R.	2S acid.
Amino acid G.	Benzidine sulfon-disulfonic acid.
Amino acid H.	Dioxy S.
Amino acid S.	Disulfo gamma.
Chromotrope acid.	Disulfo B.
Cleve acid 1-6.	Disulfo J.
Cleve acid 1-7.	Dehydro thioparatoluidine disulfonic.
F acid.	Oxydisulfonic 1-3-6.
H acid.	Sulfamide of 2S acid.
Gamma acid.	R salt.
Freund acid.	G salt.
Napthionic acid.	Schaeffer salt.
Neville & Winther acid.	

Applications

The practical applications of the fluorescence of organic coloring matters are very numerous.

In analysis, examination under the Wood light gives valuable indications; for example, it enables one to distinguish instantly, without being obliged to resort to a long and complicated chemical analysis, dyeings of colors of similar shade and tinctorial properties, such as Brilliant Diazol Yellow NS, which is very fluorescent, and Diazol Light Yellow N5J, which is not fluorescent.

In the same way, the absence of fluorescence in the case of basic colors dyed on a mordant, permits the easy detection of dyeings on viscose rayon as to whether they have been dyed with or without mordanting with Tannin or Depsoline N.

The inhibiting action of anti-oxygen compounds on the fluorescence of fluoresceine solutions facilitates research on the "anti-oxygen" power of these bodies. This property has been utilized by Ch. Achard, A. Boutaric, J. Bouchard and M. Phisalix in the study of serums and venoms.

Wolmar and Mathis have used the inhibiting action of certain ions on the salts of uranyl in mineral analysis. It is certain that one could use for the same purpose fluorescent coloring matters in place of uranyl salts.

The examination by Wood light makes it possible to discover the formation of a fluorescent body at concentrations too weak for the usual methods which might be employed. However, great circumspection must be employed when using these reactions because the fluorescence, by reason of its extreme sensitiveness, may be adversely affected by the presence of very minute quantities of impurities which may be fluorescent themselves or inhibitors of fluorescence.

Varnishes, paints and fluorescent dyed fabrics may be utilized for making theatre decorations and for the making up of clothing for theatrical purposes. As it is possible to produce non-fluorescent varnish, paint and dyed fabrics in the same shades as the strongly fluorescent products, one can cause to appear, by means of ultra-violet light, designs, advertisements, certain parts of clothing or certain parts of the decorations which, in white light, are indistinguishable from the surrounding objects.

Colorless or nearly colorless intermediates may be employed to discover defects in printed fabrics, which are not easily detected before steaming or development. Amido salt G is particularly useful in this application, but there is a large number of other products which may be employed for this purpose. Intermediates may also be used to over print on bank notes, cheques, drafts, seals invisible in white light, but sharply visible in ultra-violet light, thus proving their genuineness.

The utilization of fluorescence could also serve to reinforce the effects obtained by luminous signs using tubes of luminescent gas. In this application, one could employ fluorescent varnishes of which the exciting light would correspond to the radiation emitted by the luminous tube. But these varnishes are very sensitive to sunlight to which the luminous signs are exposed during the day and the fluorescence rapidly disappears. It would be preferable to try the use of solutions of coloring matters or fluorescent intermediates in sealed glass tubes carefully exhausted of air; the fluorescence would undoubtedly last indefinitely. If such bodies as Fluoresceine or the Rhodamines were chosen for this purpose, one would be able to obtain a fluorescence visible in daylight.

This short review of the applications of fluorescence of intermediates and synthetic organic coloring matters shows that these photo-luminescences are likely to interest industry in the most diversified fields.

Close collaboration between dyestuff laboratories and electrical illuminating engineers should certainly result in still further enlarging the field of practical utilization of fluorescence.

PROCEEDINGS OF THE
American Association of Textile Chemists and Colorists

MAY 31, 1937

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CALENDAR OF COMING EVENTS

Outing, Northern New England Section, June 4, 1937, Vesper Country Club, Lowell, Mass.

* * *

Outing, New York Section, North Jersey Country Club, June 11, 1937.

* * *

Outing, Rhode Island Section, June 18, 1937, Warwick Country Club

* * *

Outing, Mid-West Section, June 19, 1937, Rochelle, Ill.

* * *

Summer Outing, Piedmont Section, Ocean Forest Hotel, Myrtle Beach, S. C., June 25 and 26, 1937.

* * *

Annual Meeting and Convention, December 3 and 4, Bellevue-Stratford Hotel, Philadelphia, Pa.

REPORT, NORTH CAROLINA STATE COLLEGE STUDENT SECTION

IN the week of April 15th, Mr. J. E. Underwood, Manager of Development and Research of the Pennsylvania Salt Co., spoke on the electrolysis of salt and the manufacture of bleaching compounds and by-products. In the following week Mr. Ben Verity spent the day lecturing, demonstrating, and showing samples of different types of dyeing and printing, especially screen printing. He explained the latest developments in the Indigosol and Pharmasol types of dyes. The Section was honored with a visit from Mr. Cady, President of the Association, who spoke on "Finishing", describing Sanforizing, Trubenizing, Embossing, and many other things too numerous to mention.

Respectfully submitted,

J. W. FURR, *Secretary.*

Consumer Problems*

EPHRAIM FREEDMAN†

I AM very happy to be here this evening because the New York Section of this Association is an integral part of me, just as I am an integral part of the New York Section.

I attend many meetings of different groups, including consumers, retailers, manufacturers, technicians and others. At each meeting I find a somewhat different atmosphere, an atmosphere created by the particular angle from which each group views its problems. Perhaps, since this Section is composed in the main of textile chemists and colorists, I should liken the atmosphere to that of the rainbow with its beautiful colors, for it transcends by far any other atmosphere.

Perhaps I am biased, but I really do not think so for I know of no single group the members of which have given me such whole-hearted and consistent support as the members of this group. So I come to you again not to speak of washability or color permanence, or water repellency, or to tell you how we test merchandise. I am sure you all know these things. I would rather talk about consumer problems in general and consumer textile problems in particular, so as to regenerate and revitalize our thought processes in order that you and I may continue to solve these problems successfully.

Consumer problems are many and diversified, but we as textile chemists and colorists might well restrict our discussions to those which stimulate us to do better and to serve better.

Some consumer organizations have been in existence for many years. Additional ones are cropping up all over the land. Some are of local character, while others are national in scope. Among the latter may be mentioned the American Home Economics Association, the National Federation of Women's Clubs, the National Congress of Parents and Teachers, the American Association of University Women, the National League of Women Voters, and then there are a number of others—the Consumers' Research is one of them. While the aims and aspirations of these consumer groups differ in many ways, all of them have at least one common purpose: to obtain the best possible value at the lowest possible price. This purpose has existed from time immemorial and will continue until the end of time. The significant fact, however, is that consumers are rapidly becoming organized and are becoming more discerning of quality, more cautious of claims, and more insistent in their demands for factual information.

Some forward-looking retailers and manufacturers are arising to the occasion and are labeling merchandise as rapidly as possible. I use the phrase, "as rapidly as possible" advisedly, since in many instances the test methods have not been developed far enough to permit of simulating conditions created under normal use.

To illustrate, we will discuss the test for water repellency. We have a hydrostatic pressure apparatus, which discloses the height of a column of water necessary to produce water permeation, and we can, if we choose, observe the quantity of water coming through. We can place the test specimen under a rain tower and subject it to varying intensities, from fog to cloudburst. We can immerse the specimen in water and note the quantity of water absorbed. All of the foregoing tests have something in their favor, but probably only one test is practically infallible and that only under certain conditions—I refer to the hydrostatic pressure test—only when the fabric is really impermeable. The reason is that conditions of actual use are not being simulated sufficiently in the testing laboratory. I will not now discuss the exceptions to, nor the shortcomings of these tests, but shall be pleased to do so later, should you desire it.

Another stumbling block to informative labeling is the lack of a proper consumer terminology. Since I have illustrated tests for water repellency, I shall submit two samples or illustrations of materias which were treated for that purpose. A customer picked up an umbrella one day, and showing it to the sales person asked, "Is that rainproof?"

And the sales person said, "No, madam, but if you will take this one, we guarantee this to resist a hydrostatic pressure of seventeen centimeters."

Whereupon the customer retorted, "But, my dear, I don't go out in weather like that."

One day a gentleman came into the store and asked for a raincoat. He wanted a good raincoat, bu he didn't want one made of a coated fabric. He wanted the type of cloth that would breathe, and he was given a coat, the material of which had previously been tested and disclosed a resistance of thirty-nine centimeters under the hydrostatic pressure test. He stepped out of the store just when the heavens opened up—a real cloudburst followed. By the

*Presented at meeting, New York Section, March 19, 1937.
†Director, Bureau of Standards, R. H. Macy & Co.

time he had walked one block he was drenched to the skin. He came back at once and complained. Our terminology was faulty. He was sold this coat as a showerproof coat. By definition, rain is a downpour of water, ranging in intensity from fog to cloudburst. "Shower" is rain of short duration, less than half an hour. It also may vary in intensity from fog to cloudburst.

So we have this problem of terminology. What shall we do about it? How shall it be corrected? Shall we employ terms like "waterproof," "shower repellent," or "shower resistant," "dribble retardant," or shall we use terms like "for heavy rain," "for light rain," "for drizzle?" Maybe you can help. I know consumers will appreciate a solution to this problem. I will certainly appreciate it very much.

Probably still another stumbling block to informative labeling is the problem of controlling the uniformity of raw materials, plant operations and uniformity of products.

Many factors intervene to militate against uniformity, whether it be in the spinning, weaving, bleaching, dyeing, finishing, or any other operation, but the fact still remains that he who can best control the uniformity of his product is in the best position to take business where others must reject it. This was brought out quite forcefully at a recent Federal Trade Commission hearing on a proposed trade standard designating the residual shrinkage of woven cotton yard goods. The opponents of the standard admitted that they were able to supply the United States Government with millions of yards of fabrics, the residual shrinkage of which was kept down to very narrow limits. Yet, they could not see their way clear to offer the same guarantee to the ultimate consumer.

One gentleman stated that there were different grades of shrinkage, and that consumers would not pay for the better or more uniformly shrunk fabrics. Consumers, however, do not entirely agree with him. Consumers want to know what they are paying for. They ask to be permitted to decide for themselves which quality or service will best suit their needs; not that they discourage help in judging quality—on the contrary, they welcome it.

Some months ago we developed a silk-satin garment, to which we called the attention of customers who asked for silk slips, or silk gowns, particularly when they tried to buy those in the lowest price range. We were astounded at the number of customers that we were able to wean away from the sleazy fabrics to the better one.

The American Association of Textile Chemists and Colorists has ever led in the development of tests and test methods of value not only to finishers and dyers, but also to consumers. The washability test, the shrinkage test, the light-fastness test, and even the test for resistance to water are but a few of the many tests it has evolved. The one really important test not yet evolved is that for measuring the loss sustained by the textile industry for failure to utilize sufficiently and to best advantage the knowledge and experience of its chemists, colorists and other technical experts. I believe that the textile industry does not really appreciate all the time and effort devoted by these men to the solution of the many constantly occurring technical problems. I believe that the textile industry has not yet begun to realize the immense contribution it could make to its investors, its employees and to the stability of conditions in general, if it were to initiate informative labeling at the source of manufacture.

Manufacturers and retailers often become discouraged because consumers do not rise to the occasion, as it were, and gobble up worthwhile merchandise. I believe that the feeling of confidence, which must exist between consumer and retailer, and retailer and manufacturer, cannot be developed unless there is a much closer tieup between the technical man and the sales and advertising agencies of the textile industry.

I doubt that technical men had much to do with some advertisements that have recently appeared in various publications. Here is one. I shall refrain from mentioning the name of the publication, or the name of the product: "All his, yet he uses a twenty-five cent toothpaste. Mr. So-and-So, a tycoon, philanthropist, art collector and sportsman, finds this Blank toothpaste superior. It is no accident that men such as Mr. Blank, with wealth and tradition behind them, are constant users of this Blank toothpaste." Then it goes on to show his wonderful swimming pool, the pictures in his gallery, his palatial yacht and his country home.

I do not know whether he wears dental plates. It wasn't included in his art collection. But evidently, because he uses Blank toothpaste, everyone else should or they are missing a very good bet.

Here is another, taken from different pages of the same magazine. This will interest particularly the few ladies who are here. These advertisements were placed by the same advertiser, but under different postal addresses. I shall call the first "Put it on," and the second, "Take it off."

"Very full, round, alluring curves. You can add three to six inches with Put It On Cream Treatment, which has given thousands a beautiful form," and then it goes on, a long dissertation about this wonderful thing and how one individual put three inches on her chest measurement and increased ten pounds in weight with this wonderful Put It On Treatment.

On another page of the same magazine appeared this one: "Remove fat from any part. Be adorably slim." and one individual is alleged to write the following testimonial: "I was thirty-seven inches across the chest. Here is the miracle your Take It Off Cream has worked for me. I have actually taken five inches off. I am overjoyed."

Here is another, which is a pseudo-technical advertisement. This particular garment is described as wrinkleproof, moisture-proof and dust-proof. My claim about

this is that it is too bad that the Westerners didn't know of this in time to protect themselves against the dust storms.

Here is a third, an overcoat which is ten per cent warmer, lighter weight and sixty per cent longer wearing—but it doesn't say than what.

Here is one that probably doesn't fit in here, but I will give it to you anyhow: "Guaranteed suits, guaranteed for one year," and the advertisement appears on a black background with white letters, so that I doubt if the reader, even at close hand, will discern an asterisk after the word "guaranteed." Then at the bottom appears this legend, "except on soft fabrics."

Here are two examples of advertising that are instructive. This one is enlightening and instructive: "Leopard cats hate heat. Probably thieves won't steal your furs. Probably fire won't burn your furs. Probably, with proper precautions moths won't eat your furs. But heat will ruin your furs. Heat removes the natural oily content of the pelt and leaves it dry, harsh and lusterless." Obviously this is an ad for fur storage, but the information is quite factual.

Here is another that is factual and instructive, and it is my contention that facts can be given in advertising copy and still the copy can be so served up as to make it really worthwhile reading: "Electric spinner washer. No more wringing. The water is 'whizzed' out. No more feeding of wash to the wringer, piece by piece. Place all of it into the Whizzer and let it do the work while you practically—and then this is in quotations—'sit down and play lady.' Saves time, too. One batch of clothes can be washing while another batch is being rinsed."

Consumers no longer want to be fooled by illogical build-ups, even when the enhancement of beauty, charm and health are involved. Incidentally, I might tell you of an interesting incident that occurred up at Cornell a few weeks ago. I was invited to speak up there during Farm and Home Week. That same morning, a leading beautician was addressing a number of women. I understand the crowd was so great, all these ladies from the farm wanting to find out how to become more beautiful, that they had to have two extra sessions for this beautician. She had them all rocking on their toes and swaying around, and all that. She was putting them through some calisthenics, showing them how to become beautiful.

Then, she hit upon a very good thing for them. There were no men in the audience. I don't know whether that is the reason she told them this story, but she told it to them just the same. She told it to me later on. She said, "Why do women have wrinkles on their necks and why do you find that no men have wrinkles? I will tell you why: Men shave and they are always massaging their necks. Women don't and that is why women have wrinkles."

So, of course, if you would use that particular cream she was selling, with the massage, you wouldn't have wrinkles.

I believe that more money ought to be spent on research and the development of factual information. I believe that the responsibility for the accurate descriptive terminology employed in advertisements and in other literature should rest with technical men. I believe that consumers are actually delivering a challenge that must be met by industry, and that, with your help, industry can meet it to the satisfaction of all parties.

I do not wish to imply that we should call a halt on research in order to attend to these other matters. On the contrary, these problems can be handled simultaneously. Consumers are still seeking light colored bathing suits that will disclose better resistance to sunlight, chintzes that retain a permanent finish, woolens that will not shrink excessively, silk dresses and stockings and rayons that will not water-spot before and after washing, Roman-striped hose that will not stain, India prints that are washable, heavily dyed knit, woven and felt fabrics that will not crock, allergic sheeting that will not deteriorate rapidly, stockings that will not snag or run, and sheer linens which, when made up into blouses, will not dissolve away under the arms.

Incidentally, we ran across an interesting case a few weeks ago. A product was on sale as a deodorant. It was a powder. We examined it and ordered it off sale. It consisted of an aluminum salt. We ordered it off sale because there was no warning to the purchaser of the likelihood of deterioration of cotton fabrics or of linen fabrics. There was no instruction about removing the powder before donning a garment. The owner of the product was very much hurt. She said she was selling it all over town. She saw no reason for changing the wording on her label or for issuing any cautions. She was sure that no garments were falling to pieces because of the use of the product.

We ran some tests, and we found that the fabrics did deteriorate considerably, but since we couldn't agree, the product was not kept on sale, and no further orders were placed.

We had another interesting case, and this deals with the mixtures of acetate and rayon. We found a number of garments that discolored after being in the possession of consumers for relatively short periods of time. We found the silks hung away with the same garments were not affected. In most of the cases the garments were green, and we haven't found out why that takes place. We do know that we can reproduce it when we hang the garments in an acid atmosphere. It is quite likely that some acid is being produced in the material itself and that the change is being brought about in that fashion. However, we did see one garment that was hung in a closet in a room next to an outside wall, with no chimney flue alongside of it, and yet the section of the garment nearest

the wall was faded to a far greater extent than the section away from it.

These problems that I mention are only a few of the consumer problems. There are many more. Large consumer organizations have not only signified their willingness to cooperate in the development of consumer standards, but actually, they are helping develop standards. Recently, there was formed a committee of retailers and consumers working under the auspices of the American Standards Association. This committee is engaged in the development of standards which will be acceptable to consumers.

Textile chemists, colorists and other technicians have engaged in backstage work for many years. They must be brought frontstage, given more responsibility and greater encouragement. Such a move will supply the needed mortar with which to cement the confidence between consumer and manufacturer. Management must supply the mortar. Forward-looking management will, and technical men will continue to solve consumer problems.

I have brought with me a number of specimens of various labels that we are now using to help consumers to know what they are buying and how to take care of their merchandise. This is merely a stepping stone toward what we are preparing to do in the very near future, and I shall be pleased to pass these around, should you care to look at them. Any questions that you want to ask will be answered to the best of my ability. Thank you. (Applause.)

DISCUSSION

Chairman Zisman: I am certain that all of us enjoyed Mr. Freedman's talk.

Undoubtedly there are many questions. I know our friend, Freedman, is very liberal and I also know he is not a dyer. Some of you dyers have a little different slant on this matter of consumer problems, and might want to ask certain questions, so the floor is now open.

Dr. Harold: I would like to ask Mr. Freedman how close we are coming to the solution of the problem of shrinkage—what is being done by the American Standards Association in assuring the consumer against shrinkage of goods after wear. I understand that a year ago they were almost ready to assure the woman buyer that the goods sold to her would be unshrinkable, and that a label in the selvage would assure her of that.

Has there been anything done about that in a positive way?

Mr. Freedman: Well, the standard was prepared after a number of years of effort on the part of various agencies. The American Association of Textile Chemists and Colorists was represented on the Textile Shrinkage Conference, and later at these meetings under the auspices of the American Standards Association. Everyone agreed upon the method of test. There was no argument there. And everyone agreed as to the need for the marking of goods in so far as shrinkage was concerned, but the finishers felt that they weren't a party to that particular part of the program.

They agreed to the test, but they didn't want to bind themselves by guaranteeing just what the maximum shrinkage would be. Consequently the entire project was held in abeyance until the New York Board of Trade took it up with the Federal Trade Commission, with the result that a hearing was held week before last at the Hotel Astor, and this entire matter was thrashed out again.

Some of the finishers claimed that they could do a good job, but they didn't want to be held responsible for every piece of goods that was sent out. Some of them stated that they would lose sight of the goods as it went through various hands, possibly from converter to converter, and they didn't want to accept responsibility there. One of the claims made was that the goods manufactured on different looms, and also on different days under varying atmospheric conditions, would be likely to disclose varying amounts of shrinkage, and unless they employed controlled methods and pre-tested sufficiently, they felt they would be sticking their necks out. Of course, that brought up the problem as to whether the man who really worked under controlled conditions and produced a more uniform product wasn't entitled to more money. Everyone agreed that he was, but then the question came up as to whether consumers would pay, and that, to my way of thinking, was immaterial because we find from actual experience that when value is there consumers are willing to pay more for it. They don't like to pay more and then not get what they are supposed to get.

Does that answer your question?

Dr. Harold: Then we are no nearer a solution?

Mr. Freedman: Except that it is in the hands of the Federal Trade Commission now. So that I believe we may expect some action in the very near future.

Mr. Herrmann: Mr. Freedman, did I understand you to refer to allergic sheetings?

Mr. Freedman: Yes.

Mr. Herrmann: What is the connection?

Mr. Freedman: I mean that some people manufacture sheetings and materials for use on pillow cases and mattresses to be used by people who believe, or have cause to believe, that they are affected by feathers, hairs or dust coming from filling material. For these people there are on the market some coated fabrics for sheetings. They are supposed to withstand many washings without deteriorating, but the claims are usually far beyond the actual performance of the sheeting, so far as deterioration is concerned.

Mr. Herrmann: You mean the impervious feature is lost very quickly?

Mr. Freedman: The coating cracks or peels off, some-

times it becomes sticky just like some of the rubber sheetings behave.

Mr. Herrmann: You also mentioned something regarding bathing suits in light colors, fancy colors. Do you refer to worsted or woolen bathing suits particularly?

Mr. Freedman: I think that would hold true more with the woolens and worsteds than it would with some of the others.

Mr. Herrmann: Does that take into account the willingness of the consumer to pay a little extra for this quality?

Mr. Freedman: Yes, I have taken that into account. I believe the answer there is that we haven't yet evolved a proper terminology for describing color permanence to consumers. We use terms like "sunfast," or "colorfast" and consumers feel that they are entitled to everything under the sun when terms like those are used. If, on the other hand we could say, "Standard A," or "Standard B," or "Standard C," or "Standard D," instead of using the technical terminology now employed in our Year Book, and if for the best type of color permanence, in so far as sunlight is concerned, or resistance to fading by sunlight, we said "Standard A" for color permanence, or "Standard B," or "Standard C," I don't think it would take long for consumers to realize that when they bought something marked "Standard A," that was worth a little more than buying something marked "Standard B."

Mr. Herrmann: I was wondering if the consumer was ever given the privilege of purchasing "Standard A" in the bathing suit line and when you say that it isn't available, whether it is due to the fact that you feel that the consumer doesn't want to pay for it, or whether the manufacturer isn't willing to give it to you?

Mr. Freedman: I think the problem is even more involved than that. I think the problem is that it hasn't been tackled from the point of view of the consumer: that if the man who has a bathing suit the color of which discloses the highest degree of permanence as applied to sunlight would mark that bathing suit "Standard A" for color permanence, or "Color Permanence Standard A," and if alongside of that the retailer had one that looked the same but was marked "Color Permanence Standard B," I believe the individual would pay more for the "Standard A" than for the "Standard B."

Mr. Herrmann: I just ventured the opinion that possibly if the manufacturer of the bathing suit realized that there was a genuine demand on the part of the consumer, and that the stores would be willing to merchandise "Standard A" quality bathing suits, such suits would appear on the market, because from a technical angle they are entirely feasible and possible.

Mr. Freedman: Are they in all light shades?

Mr. Herrmann: I think in a sufficient range to take care of most all requirements.

Mr. Freedman: To take care of some of them?

Mr. Herrmann: It is going to add a little here and there to the price, but there seems to be a sentiment that the public doesn't want it, or that the public wouldn't pay for it, and because it involves some alterations of present manufacturing methods, or dyeing processes, people don't try it. It isn't being attempted and yet it has been possible for some years.

Mr. Freedman: We are heading for that very thing and I believe that by next year we will find thousands of items on the market marked so that the consumer will know the quality of the material.

Mr. Herrmann: To discuss it from a technical angle for a second, knitting yarns are preferably dyed in the skein. It may be necessary to dye in the stock in order to get this fastness. If a mill is geared to do skein dyeing and they object to doing stock dyeing, they may put obstacles in the way of a development of that sort. Real, worthwhile developments have never been stopped for a very long time for such minor reasons. Therefore, I believe that if there is a real sentiment for improvement of woolens in point of fastness in light or fancier shades, and it is known that these things are obtainable, then they can be had if you will insist on them.

That leads me to one last question. You mentioned the atmospheric effect on acetates. To what extent has this shown itself?

Mr. Freedman: Well, within a period of one week I saw about five garments made of different types of——

Mr. Herrmann: What is being done about it?

Mr. Freedman: In what way?

Mr. Herrmann: Well, I mean you are vitally interested?

Mr. Freedman: That is right.

Mr. Herrmann: You don't want the stuff on your premises. The consumers probably wouldn't want it. I just want to know.

Mr. Freedman: The problem has been taken care of as far as the consumer is concerned. As far as the other phase of it is concerned, we are conducting some experiments at the present time to see what we can find out about it and I have also turned the problem over to some of the manufacturers of the acetate rayons to see what they can find out about it.

Mr. Herrmann: There is a genuine problem there, and I think it calls for cooperation of all the factors involved in the production of an acetate garment, from the yarn right through. It is a real problem, and I am sure that well-thinking, right-feeling manufacturers (I don't say that they are happy over it) are willing to cooperate in solving the problem.

Mr. Freedman: While I have taken this up with some of the producers of the acetate yarns, I have also waited for this evening to announce it because I thought I could get more people to know more about it this evening than I could by sending out letters to a lot of people.

Mr. Herrmann: It is one of the things that people haven't wanted to talk about.

Mr. Freedman: Yet, it is very important to talk about it because I think the popularity of acetates is at stake when such a thing takes place and no action is taken. Of course, retailers can just discontinue carrying something so far as that is concerned. The public will give a product a black eye in no time if it doesn't prove satisfactory, but that really isn't the way to look at it. As I see it, if something is at fault, the various interested parties should get together and solve it as quickly as possible.

Mr. Herrmann: But you haven't yet developed a test to determine the nature or cause of this color reaction?

Mr. Freedman: We can reproduce it by hanging the material in an acid atmosphere.

Mr. Herrmann: What acid?

Mr. Freedman: We are finding some sulfurous acid will do it, and some hydrochloric acid will do it.

(See Note, Page P308.)

Dr. Meili: I found that I could only reproduce that condition with nitrous acid.

Mr. Freedman: Were you getting a reddening or a graying?

Dr. Meili: Well, in a green, a graying, and in a blue, a reddening.

Mr. Freedman: There is one green that turned grayish.

Dr. Meili: This change seems to be entirely due to the blue. We are recommending a faster blue dyestuff for light and medium shades which does not show any serious fading in storing. This faster blue in medium shades is slightly more expensive than the blue in common use. The dyer therefore should get a premium for special quality work.

Mr. Freedman: The answer to that is the informative labeling that I am talking about, because if dyed goods are marked as to the standard of the quality of the material, the customers will pay more for those goods.

Dr. Meili: If the dyer can get more for his work he will take better care. The suggestion of having goods fast to light marked "A," "B" and "C" is all very nice from the point of view of the dyestuff manufacturer and the department store, but is quite a problem for the dyer. I am surprised that no dyer has gotten up and said something tonight.

In dyeing goods with the best fast to light dyestuffs, I often had unsatisfactory results that could not be foretold. The poor fastness may have been caused by inter-reaction of the dyestuffs or may have been due to the finishing material or to the quality of the goods itself.

Mr. Freedman: I believe that is common knowledge. So far as we are concerned, what you say is true.

Dr. Meili: It therefore is very difficult for the dyer to guarantee a quality unless he is paid considerably more for this kind of work.

Mr. Freedman: That is the particular line of thought that militates considerably against the type of progress that would be of considerable benefit to the textile industries.

My view of the matter is this: that if consumers want curtains that will only last a couple of months, or a month, or even two weeks, for the summer bungalow, they should be made available for consumers and they should be marked that way. But if the consumer wants materials that are going to last a longer period of time, those materials should be marked that way and higher prices are obtainable for them.

But if, on the other hand, materials are sold at varying prices, and no matter what price you pay for them you still get poor results, what incentive is there to the ultimate consumer to buy the better class of merchandise? So, as you put it, you might well say, what comes first, the chicken or the egg? You say if the dyers will get a higher price then they can produce a better garment. Consumers say, "If you will give us better merchandise, we will be willing to pay more money for it."

There must be an understanding somewhere. There must be a meeting place where you can both get together. That meeting place, to me, appears to be attached to the problem of informative labeling. Through informative labeling one can do a proper merchandising job.

One of the advertisements I read before had to do with toothpaste. There was nothing informative about it. It was just a lure—because a particular individual used it that was why everybody should pay that price and buy that particular toothpaste. That is what we want to get away from. That is why we are able to sell merchandise of a higher class to an increasing degree, because we are marking our merchandise. And we are preparing to mark a good deal more of it.

I can cite an incident involving an individual who is here this evening. He reminded me about it this evening. He wrote in saying that he had a particular process which would permit us to obtain woolens that would not shrink to the degree that they usually do. He was invited in to see a particular buyer in the store. The buyer in turn sent him to his source of supply, and he has been able to do business that way and we are able to get better merchandise as a result of it. We do those things frequently.

We have been working with a particular company for some time on the subject of moth repellency of fabrics. We have gotten to the stage where we feel we have something that is going to be quite good, and I am sure that when consumers are asked to pay more money for that type of merchandise they will pay it gladly because it is cheaper in the end to buy merchandise of that type than it is to buy the other.

Mr. Krassner: I noticed in the descriptive labeling that was being passed around one particular item which attracted my attention. That was in connection with water-

proofness, where the statement was made that the material used to cover upholstery was guaranteed waterproof, but that the guarantee did not hold for the seams in the event that water got in through that medium.

I was wondering whether you contemplated the same type of labeling for raincoats, that is, whether the same thing would be true of the seams of raincoats. That particular problem presents itself to us in the Navy Department, and we are adhering more or less rigidly to the specification that the seams be as waterproof as the garment itself; in other words, that the seams of the raincoat withstand the hydrostatic pressure of fifty centimeters, by virtue of which it is considered waterproof, the same as the body of the garment itself.

What has been your experience in that connection?

Mr. Freedman: I believe you are right in insisting that the seams be as resistant to water as the rest of the garment. If the seams are taped and cemented you will find that that can be brought about. You might also run an ageing test on some of that material, and then again subject it to your test under the hydrostatic pressure apparatus and see whether any deterioration has occurred which would reduce the degree of waterproofness.

Mr. Krassner: What would be the ageing test?

Mr. Freedman: I believe you might well place some of that material—if you haven't an oxygen bomb—in an oven at 158 degrees Fahrenheit for a period of one week. You might place some of it in the Fade-ometer for a hundred hours, take it out and try that test on it.

Mr. Krassner: But you would maintain the same standards for the seams as for the body of the garment?

Mr. Freedman: I would if I were you, yes. There are a number of people who don't seem to mind very much whether they get the other type of coat, but we at least want to inform them about it at the time of purchase and let them judge whether they want to pay more for the better garment or not. In other words, with the consumer being the judge, the responsibility transfers over to the consumer. I think we are far advanced there as compared to dyers and finishers, or to people in the textile industry in general, because they are not quite so willing to hand out this information to consumers as we are.

Dr. Harold: I think that nitrous acid test deserves some explanation. I think it is the sentiment of most of us that a test which is not simulative of exposure is of little importance, but what has justified the nitrous acid test perhaps is the application of a very good rule in the search for the cause of damage, and that is, that any test that is reproductive of results is simulative of causes.

We don't know that nitrous acid is developed in these goods. There is no proof of it, but the textile tester in looking for cause of damage nearly always applies that principle: Try to see what reproduces the resultant damage, and in nine cases out of ten, in simulating the effect, you will have put your hand upon the cause. The trouble is with the one time out of ten, when you may have simply accidentally reproduced a result and have not simulated the cause at all. I would say in this nitrous acid test that before we rely on it at all we should make sure that there aren't other and simpler tests more reproductive of actual exposures that reproduce the effect, before we rely upon it as indicatory of a cause.

Mr. Freedman: Dr. Harold's remarks remind me of a complaint we had some years ago. A customer returned some curtains and complained that they had faded. We submitted the curtains to the rays of the Fade-ometer, and then the customer was informed that the curtains were faded because of exposure to sunlight. The customer replied, "Why, my shades are always drawn. The curtains beside the windows do not get any sun."

Believe it or not, we found the customer was right in so far as her contentions were concerned, because we were able to reproduce the fading with the ordinary tungsten bulb. Since then we use a little cylinder with a tungsten bulb inside of it and now and then, when we feel we ought to run tests of that type, we run them with the tungsten bulb and are able to reproduce various types of fading. And we do not get the same results when we place them in the Fade-ometer.

So again I question the advisability of using the nitrous acid test unless we can be shown that nitrous acid is something which is found in the home.

Dr. Harold: Yes. The same thing is true with regard to the sulfurous acid test. When you make a sulfurous acid test, you are not making an acid test at all. You are merely making the test of a reducing atmosphere, and frequently in the Fade-ometer you are noting no change due to sunlight, but if you are not careful in running your Fade-ometer, you may be making simply tests of the action of heat.

That is why the more modernized Fade-ometers do away with the heat effects by having powerful drafts and well-moistened air. One has to be careful that in submitting a material either to an acceleration test or a test to identify the cause of damage, you are not submitting the material to a plurality of influences and blaming it simply on one.

Mr. Freedman: We are using the later type of Fade-ometer.

Chairman Zisman: I might add something that is interesting in connection with silk which has sort of a bearing on this acetate difficulty. I don't know if some of the silk men here have had this experience. Undoubtedly many of the dyestuff men have.

There are some silk dyes—in this case the culprit is red instead of blue—which will turn greenish under certain atmospheric conditions. In this particular case, if my memory is correct, it was a sulfurous acid condition—a reducing condition. I found that that condition existed chiefly at a time, and in certain sections of the country,

where a great deal of soft coal was used. It is quite characteristic of many of these reds, ordinary acid reds, used in silk. But the damage can be definitely traced to a chemical reaction that is quite plausible and which we know will happen under certain atmospheric conditions. Because that happened that way, we felt certain we knew why that particular red turned greenish. We can duplicate that condition at will and create such atmospheric conditions. It had to do with certain moisture conditions, as well, that accentuated the tendency of such colors to turn. It was not due to any fading of sunlight or anything like that, of course.

Dr. Harold: Apropos of what you said, Mr. Zisman, I might say there are a number of dye testing laboratories in town which have found the air of New York is so filled with acid fumes that they wash their air in the sunlight test, so that the sunlight test is purely a test for sunlight and not for New York air. I think there is one building in New York that gives off five tons of SO_3 per day. It is burning a Mexican oil for heating the building, and the equivalent of that one building is five tons of sulfuric acid per day.

Mr. Drew: With regard to printed cottons (cheap percales in other words) which are used in ordinary house dresses, I have seen washing instructions on that type of fabric instructing very careful handling of the goods: Use the right suds, do not hang in the sun to dry and all that. It seems to me as though that is exaggerating the precautions necessary for fastness property. It seems as though you could almost use fugitive colors and, by using that treatment, get comparatively fast results.

Doesn't it seem as though the thing should be brought out more into the open; that really fast colors have real fastness properties?

Mr. Freedman: Mr. Drew, there are many things that affect the color permanence of fabrics. I prefer to use the term "color permanence" to "color fastness" because to my way of thinking there is nothing fast under the sun.

Dr. Harold has just referred to the acid fumes in the atmosphere, and you have the alkali that is washed or leached out of the mortar of buildings—the mortar between the bricks in buildings—which affect the color of fabrics. Abrasion affects the appearance, so that the color may appear to be affected. There are many other factors which influence the appearance of dyed fabrics. The term "fast" therefore, or "color fastness" is a dangerous term to use—particularly the term "fast."

Mr. Drew: I don't know that I made myself clear. It seems to me, at least, that if those precautions were followed, various colors could be used and stand the test.

Mr. Freedman: That would depend upon the number of washings, I believe. I think you will find that some of the colors might not stand as many washings as you imagine, or as much sunlight as you might imagine. I think it is always best to err on the side of conservatism rather than to stick your neck out and promise the consumer the world, and then find that she complains, because she is really justified in complaining then.

You have that example with colored bath towels and with colored bed sheets, for example, or with white bed sheets, the borders of which are colored. The pillow cases may be washed more than the sheets, or the sheets more than the pillow cases, and if they are hung out to dry, or if they are subjected to bleach treatments, it doesn't take very long before the consumer discerns a difference in the appearance of one as compared with the other, and then there is a complaint.

So I think it is best, as I said before, to err on the side of conservatism, rather than go out and say, "Boil these to death," or "Hang them out until the cows come home," or something like that.

Mr. Krassner: I think, in addition to that, in answer to the gentleman's question, there should also be taken into consideration the minimum standards in the Federal specifications for cotton materials that are dyed, that they should withstand, for example, a washing test of 160 degrees with soap and soda. I don't think that is so mild that any type of dyestuff could get by. I think that that is rather severe. In general, I think that is what is expected of any dye on a cotton. Isn't that correct?

Mr. Freedman: Yes, that is the washability test for cotton, and the washability instruction for cotton.

Mr. Hirsch: Mr. Freedman, is there any real consumer demand for these allergic sheetings?

Mr. Freedman: Sufficiently so that I am interested in seeing some that will stand up real well.

Mr. Hirsch: Are the present type treated with the synthetic resins?

Mr. Freedman: I don't know, so I can't answer that very well.

Mr. Hirsch: One other question, in connection with this shrinkage problem: The shirts that Macy markets marked "pre-shrunk," is there any definite standard that has to be met before they will mark shirts that way?

Mr. Freedman: Yes, the materials won't shrink more than two per cent.

That is an interesting question and I would like to expand upon that and say that even though material may not shrink more than two per cent when made into a garment, because of the seaming of the shirt, stitching and so on, the shirt itself may shrink more than two per cent even though the material itself is pre-shrunk. So that the residual shrinkage is not more than two per cent.

Mr. Krassner: I would be interested to know from Mr. Freedman's studies on the moth-proofing compounds, whether he has come across any satisfactory compounds for woolens such as some of the types that are used for impregnating woolen materials?

Mr. Freedman: Yes, I have. However, I know of no

product that is capable of developing that degree of resistance to moth ravage which will permit or warrant our using, or anybody using, the term "moth-proof." I have seen cases of fabrics made of rayon where, even though the moth larvae evidently did not ingest the rayon, some slight change in the surface of the fabric had taken place. I still believe that moths have to taste things before they decide that they are not going to eat them, or that they can't eat much without getting sick, or something happening to them, and some slight effect may take place.

We have a tag on some of our rug cushions which actually informs the customer of that very thing and we have no complaints. We don't call it "moth-proof." We inform the customer as to just what to expect of it. And there again is an outstanding example of the value of informative labeling.

NOTE

APRIL 8, 1937—Further tests in Macy's Bureau of Standards also disclose staining of the green acetate rayons when subjected to fumes from a 1 per cent solution of H_2SO_4 and to fumes developed from an admixture of $NaNO_2 + H_2SO_4$, in addition to those previously reported.

MEETING AND ELECTION OF NORTHERN NEW ENGLAND SECTION

A MEETING of the Northern New England Section was held at the Andover Country Club, Andover, Mass., on Friday, May 7, 1937 with over one hundred members present.

J. W. Millard of the Carrier Engineering Corp., Boston, Mass. gave a short talk entitled "Air Conditioning in Textile Mills." He explained some of the engineering aspects of this subject which was much appreciated by those present. This was followed by a showing of the Dupont film entitled "Wonder World of Chemistry."

An interesting and instructive question and answer period was then held. This part of the program was arranged by K. H. Barnard, who had it conducted as a court session with George Linberg serving as an able judge and John Grady as an efficient police officer. In addition to the prepared answers, the members much enjoyed the humorous presentation of this part of the program.

Election of officers for the year 1938 also took place at this meeting as follows:

Chairman, Dr. Carl Z. Draves; Secretary, John N. Dalton; Treasurer, John H. Grady; Sectional Committee, Gordon Thompson, Hugh E. Ross; Representative to Nat'l Nominating Committee, W. R. Moorhouse; Nat'l Councilor, Roland Derby.

Respectfully submitted,

JOHN N. DALTON, *Secretary.*

MEETING, MID-WEST SECTION

A MEETING of the Mid-West Section of the American Association of Textile Chemists & Colorists was held on May 8th, 1937, at the Hotel Schroeder, Milwaukee, Wisconsin.

Preceding the regular meeting an open forum was held covering many problems of interest to our members under the able direction of Messrs. Clarence Wille and A. J. Feit.

Dinner was served at 6:45 P.M., there being 87 members and guests present.

The meeting was called to order by Chairman Siegrist and the minutes of the previous meeting were read and approved.

A letter was read from Mrs. John Miller of Lacon, Illinois, thanking the section for the flowers sent upon the passing of Mr. Miller. Another letter was read by Mr. B. C. Blowney from Max Zelisch thanking us for our aid in his recent trials and tribulations caused by the Ohio River floods.

The Chairman called the Members attention to the Annual Meeting to be held in Philadelphia on December 3 and 4, 1937.

A discussion was then held about our Annual Outing. Rochelle, Illinois, was chosen and Saturday, June 19, 1937, as the date. The Chairman was instructed to organize a committee for this event.

The speaker of the evening was Dr. E. W. Pierce of the Ciba Co., New York, who spoke very interestingly on the subject of "Diagnosis of Ordinary Plant Difficulties". This was followed by the usual question period.

The meeting was adjourned at 9:15 P.M., after which a floor show was enjoyed by all present.

Respectfully submitted, HERBERT W. TETZLAFF, *Secy.*

MEETING, PHILADELPHIA TEXTILE SCHOOL STUDENT SECTION

THE April meeting of the Philadelphia Textile School Student Section was held on Friday, April 16, 1937, at 1:00 P.M. Chairman John Waldo introduced the speaker of the afternoon, Mr. H. G. Smolens, Consulting Engineer of the Buffalo Electro-Chemical Co., who gave a very instructive lecture on "Peroxides in Bleaching."

Election of new officers and Sectional committee was planned for the next meeting.

Respectfully submitted, WAYNE F. FRY, *Secretary.*

MEETING, THE PIEDMONT SECTION

THE Spring meeting of the Piedmont Section was held at the King Cotton Hotel, Greensboro, N. C., Saturday, April 17, 1937. The Council of the National Association and the Research Committee met in the morning with Mr. Cady presiding at the Council meeting and Dr. Olney at the Research Committee meeting.

The afternoon technical session was attended by about one hundred and fifty. The following papers were presented:

"Hosiery Finishing", by J. R. McAteer of the Hatch Full Fashioned Company.

"The Importance of Temperature Control", by Albert W. Chase of the Foxboro Company.

"Dyes—How They Are Made", by C. Scott Althouse of the Althouse Chemical Company.

"Cellulose From The Whole Cotton Plant", by Dr. Alfred R. Macormac of Alabama Polytechnic Institute.

Each paper was followed by an interesting discussion. The papers of Mr. Chase and Dr. Macormac were illustrated with motion pictures. Dr. Emil Heuser of the Canadian International Paper Company, a recognized authority on cellulose, made some illuminating comments on the difficulties involved in the recovery of pure cellulose, at the conclusion of Dr. Macormac's paper.

The banquet Saturday evening was attended by two hundred and thirty. Dr. Olney, Mr. Cady, and Professor Bertolet gave interesting talks on the various activities of the association. The Sedalia choir of Greensboro rendered several selections which were thoroughly enjoyed by those attending. Mr. Walter Hadley, chairman of the South Central Section, invited the members of the Piedmont Section to attend the Summer Outing of his section, to be held on Lookout Mountain, Tennessee.

The technical papers and Mr. Cady's address will be published in the REPORTER.

Respectfully submitted, A. HENRY GAEDE, *Secretary*.

ONE HUNDRED AND FIFTH MEETING OF THE RESEARCH COMMITTEE

THE 105th meeting of the Research Committee followed the Council meeting in Greensboro, on Saturday, April 17, 1937. Present were Chairman Louis A. Olney presiding, J. R. Bonnar, E. C. Bertolet, W. H. Cady, H. M. Chase, S. M. Edelstein, A. H. Gaede, H. P. Goller, W. E. Hadley, B. L. Hathorne, W. R. Moorhouse, C. B. Ordway, R. E. Rupp, T. R. Smith, R. H. Souther, A. R. Thompson, Jr., Ben Verity, W. A. Wolhar, P. J. Wood, and H. C. Chapin, Secretary.

The Chairman reported on the progress of Mr. Ryberg's work on determination of oil, soap, and other extraneous matter in wool. Mr. Cady reported on the printing paste research, stating that Dr. Glarum would take another position on July first, but meanwhile would arrange for continuation of the work in other hands. Mr. Thompson, representing the Mercerizing Committee, introduced Mr. Edelstein, who discussed his own work. It was voted that the results be assembled and printed in pamphlet form. Mr. Chase requested that a list of all reprints of papers available through the Association be published, and the Chairman and Secretary of the Committee were so instructed. Mr. Wolhar showed samples of goods mercerized after dyeing.

Respectfully submitted, H. C. CHAPIN, *Secretary*.

PUBLICATIONS AND TEST MATERIALS, WITH PRICES

AMERICAN DYESTUFF REPORTERS

Back numbers of the year 1937 can be obtained from Howes Publishing Co., 440 Fourth Ave., New York City; earlier numbers from the Secretary of the Association, Lowell Textile Institute, Lowell, Massachusetts. Prices postpaid: 50c each to non-members, 35c to members; complete volumes $5.25 to non-members, $4.50 to members.

YEAR BOOKS

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Members of this association, who are without employment, should forward to the secretary a statement as to their qualifications and experience. This information will subsequently appear on these pages with an identifying key number. Employers are also requested to file with the secretary or the American Dyestuff Reporter any vacancies which may occur in their businesses.—H. C. Chapin, Secretary, Lowell Textile Institute, Lowell, Mass.

Key: A—Laboratory and research; B—Dyeing or printing; C—Finishing; D—Sales; E—Instruction; F—Executive.

NOTE: PERSONS WHO HAVE OBTAINED EMPLOYMENT SHOULD NOTIFY THE SECRETARY OR THE AMERICAN DYESTUFF REPORTER AT ONCE.

Prospective employers may file vacancies either with the secretary or the American Dyestuff Reporter.

A-1

Education—B.T.C., Lowell Textile Institute.

Experience—Two years as chief chemist in cotton mill. Experienced on direct, vats, naphthols, sulfur, basic and developed colors. Two years' experience in protein, fat fiber and mineral control in grains and animal feedstuffs. Age 28.

A-B-1

Education—Graduate chemist and colorist from a leading textile institute. Speaks French fluently. High standing at school. Awarded 1st prize in chemistry. Member of honor society.

Experience—Knowledge of most processes of textile manufacturing and some experience in woolen and worsted piece and stock dyeing and color matching. Presently employed in other department but wishes to get into laboratory or dyehouse.

A-B-5

Education—Graduate of the University of Lausanne, Switzerland. Doctor's degree in Chemistry. Knowledge of French and German.

Experience—Eleven years with large bleaching, dyeing, printing and finishing plant as assistant Chemist and then Chemist in charge of the Laboratory. Experience in dyeing and printing cotton and rayon fabrics; research and analytical work. Woman.

A-B-7

Education—Evening school in textile dyeing.

Experience—2 years laboratory in dyehouse; 9 years dyer and foreman on hosiery, ribbons and rayon; 2 years assistant to superintendent. Can handle help efficiently. Desires position as supervisor or demonstrator of dyestuffs. Age 30; married. Prefers vicinity of New York.

A-B-C-1

Education—B. S. in Chemistry, Massachusetts Institute of Technology.

Experience—7 years with a prominent worsted mill as assistant chief chemist, chief chemist, and superintendent of dyeing and wet finishing. Thoroughly familiar with chemical problems of worsted industry. Age 33; single. Location unimportant.

A-B-C-2

Education—Graduate of Lewis Institute of Engineering of Chicago and graduate of Philadelphia Textile School (Chemistry and Dyeing department).

Experience—Has had extensive experience as assistant chemist and colorist in silk printing, dyeing and finishing; also dyeing raw stock wool; and dyeing and finishing cotton and rayon. Age 30; married; references.

A-B-C-3

Education—Graduate, Chemistry and Dyeing Course, Lowell Textile Institute, 1934.

Experience—Has experience as chemist; dyer of union knit goods (cotton and woolen); experienced bleacher on both. Has handled Tube-Tex processing on cotton and rayons. Single; will go anywhere.

A-B-C-D-1

Education—B.S. in Chemistry, Massachusetts Institute of Technology.

Experience—Combination of plant and laboratory work pertaining to bleaching, dyeing, printing, finishing of cotton, wool, artificial silk. Familiar with wool scouring; sizing of cotton, wool, rayon warps; analytical work; some experience in the manufacture of soaps, finishing compounds and wetting agents; technical service and sales work; paper mill experience; age 44; married; two children.

B-3

Experience—Foreman piece dyer for the past 21 years. Can dye the following: celanese, rayon, cotton backs, wool, silk and mixed fabrics. Has knowledge of finishing and laboratory work.

B-4

Experience—Foreman dyer in charge of ribbon dyeing for 20 years. Experienced on silk, cotton, rayon, acetate yarn. Age 41; will go anywhere.

B-F-1

Experience—As executive had charge of the dyeing of ribbons and piece goods for 6 years; spun silk yarn, fast and resisted dyeing for 8 years; hosiery for 12 years. Has been quite successful in all three of these mills. Age 50 married. Will go anywhere.

F-1

Education—Graduate of School of Textiles, Saxony (1925). Graduate of School of Commerce of University of Berlin (1928).

Experience—Worked in various departments of textile mills as worker, later as a supervisor. Familiar with the production, calculation and management of manufacturing. Thirty years old; unmarried.

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BUDGET BALANCING AND RELIEF

THE announcement that further borrowing will be necessary in order to pay the bills for the fiscal year of 1937 is no surprise to anyone who has been observing the course of events, according to Harley L. Lutz, professor of public finance at Princeton University. Two major factors are said to be responsible. The first is the disappointing yield of the 1936 tax changes. This should surprise no one. It was obvious last summer that the official experts, in their eagerness to support the indefensible tax proposals then under consideration, were disposed to provide optimistic estimates of the revenue yield. The Treasury must be prepared for still more disappointing tax yields in the future, if this tax policy continues, for the plan is deliberately calculated to rob the good years at the expense of the lean ones.

The second reason advanced by Professor Lutz deals with the continued high cost of relief. This is not surprising either, in view of the failure of the federal authorities to do anything at all toward relieving the country of the burden of relief. According to the professor "When the history of our handling of this task is written, the verdict will be that it was successfully accomplished in the sense that physical distress was generally prevented but that it was a colossal failure from every other point of view."

We have had enormous expenditures for relief purposes in the past several years and as far as terminating the burden of relief it appears that we are no closer to a solution of the problem at the present than we were at the start. As far as the facts of unemployment itself are concerned we know very little. We have no useful information about the persons composing the unemployed masses; we do not have an adequate census of the unemployed; we do not have publicly operated facilities for the promotion of re-employment; and it would appear that the use of the relief funds has been slightly suggestive of patronage. However one thing has been mastered: the ability to expend lavishly the public funds. We have done this in a sentimental and wholly unbusinesslike way. The ease with which funds have been secured, through the manipulation of credit, accounts for the indifference hitherto displayed toward the relief policy. Many citizens have been led to believe that relief funds are painlessly provided, that their supply is inexhaustible, and that their lavish distribution is a token of the generous benevolence of a government which exists primarily for the support of its citizen-children.

On the part of the administration the characteristic attitude has been that the solution of the unemployment problem lies principally, if not wholly, with the private employers. In his budget message in January of this year the President said that the bulk of those on relief were unskilled and added "It is my conviction that if every employer or potential employer will undertake during the next six months to give employment to persons receiving government help now, the national budget can thereafter be kept definitely in balance."

It was not explained, however, how the employers could take on any large number of unskilled employes from the relief rolls, except as an act of philanthropy. It is in the lack of skilled workmen that the relief policy has been most objectionable. Idle equipment and foremen could have been utilized to greatest advantage in training the unskilled workman. Instead of being a period of training and instruction that would have helped many persons to become self-supporting in private employment, the past five or six years turned out to be more or less of a holiday.

The lack of skill among those still on relief exposes the fallacy of stimulating employment by marked reduction of working hours. This will not convert unskilled into skilled workers, nor will it qualify the former in any way to carry on production as the latter spend fewer hours per week in the factory. In fact an exaggerated reduction of the hours of work for skilled laborers will do nothing toward providing more jobs for the unskilled. It will simply increase the production costs of the goods made under such working conditions.

When the administration of relief first started a tremendous problem presented itself and one cannot blame the administration for waste and useless expenditure of time. But after the preliminary ideas started to function and errors became glaring something constructive should have been done with the funds provided for relief that would have benefitted the unemployed in the future. As it is, the unskilled on relief remained unskilled and when accepting private employment must take positions for which no particular qualifications are necessary.

Woolen and Worsted Lubricants-II

WERNER VON BERGEN

(Concluded from May 3, 1937 issue)

THE unevenness and variation in the distribution of the oil content of the test piece as seen in Table 5 is still too great and the accuracy of the test questionable, as per example, the case of the distilled Red Oil, where differences of over 1 per cent occurred. The weak point of this method is the manner of soaking the cloth in the ether-oil solution. Realizing that the proper soaking can only be done when the entire cloth comes in contact with the oil-ether solution at the same time, the porcelain dish was replaced by a shallow tray as used in restaurants for serving food. The tray was filled with the necessary ether solution, then the cloth was passed under the surface of the ether in its open width and directly through the wringer and air dried. By working in this manner the concentration of the oil in the ether solution must be increased to about 17 cc. (15.5 gr.) in 500 cc. to get approximately 5 per cent oil on 100 gr. of cloth, as an excess amount of ether drips back in the tray from the wringer.

The following data prove that through proper immersion the variation over the width of the test piece as represented by sample one to four, can be reduced to such a point that the accuracy is not questionable.

	Cotton Seed Oil	*Linseed Oil*
	%	%
1.	3.10	3.54
2.	2.92	3.54
3.	3.07	3.53
4.	3.13	3.56

In conducting these tests a fault in the construction of the Fade-Ometer* was detected which affects the light influence to such an extent that errors are caused. Special precautions are necessary in regard to the placing of the cloth in the Fade-Ometer, as can be seen from Figure 5 because a shadow is cast in two places by the rods which support and carry current to the lower carbon electrodes.

By actual measurement, this shadow extends over a width of about two inches. The effect of diminishing the intensity of the light, should a dyed sample be hung directly in the shadow, is to increase the apparent fastness about one class. In the oxidation tests the fatty acid content is retarded between five and ten per cent during the forty hours exposure.

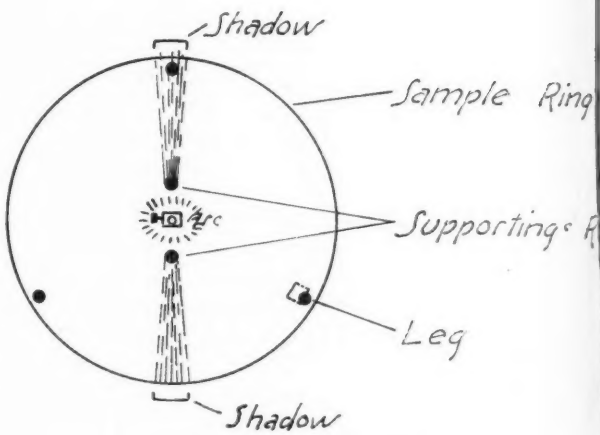


Fig. 5—Shadow in the Fade-Ometer

To overcome this defect, we arrange the samples for oxidation as illustrated in Figure 6.

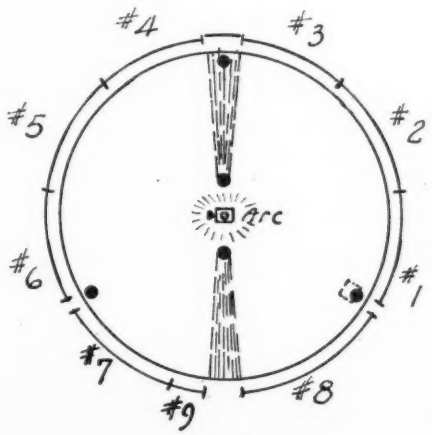


Fig. 6

*Manufactured by the Atlas Electric Devices Co., Model 1936.

Samples Nos. 1 and 2..... 5 hours
3 and 4.....10 hours
5 and 6.....20 hours
7 and 8.....40 hours
9.....Mask SL-6

The following divisions on the Mask SL-6 are made:

Start.....All open
After 5 hours.....A is covered
After 10 hours.....B is covered
After 20 hours.....C & D are covered
After 40 hours.....E & F are covered

This gives a record of the change, in the color of the sample under examination before the extractions are made.

The size of the sample taken for the oxidation test is as follows:

51 inches long and 12 inches wide, and the dividing of the piece in various samples for conducting the test is seen in Figure 7.

In addition to the five oils (Tables 4 and 5) the oxidation of eight other oils was tested and the results tabulated in Table 6.

INTERPRETATION OF THE AGEING TEST

From these figures the various facts mentioned in the discussion of Tables 4 and 5 were further strengthened, each group of oils showing a characteristic change during the exposure.

The drying oils as represented by linseed oil, show a loss of over forty per cent of ether extractable matter in the first five hours of exposure which increases to over seventy-five per cent in forty hours. Parallel to this loss goes an increase in the fatty acid content, which reaches fifty-five per cent and more in forty hours.

It is very difficult to establish the amount of fatty acid at the start of the test because the oxidation sets in as soon as the oil is applied to the cloth and a delay in the extraction of the unexposed samples for a few hours means a difference of several per cent. The extraction should therefore be started as soon as the ether from the soaking operation is evaporated.

After forty hours exposure the linseed oil treated samples are very stiff, which is another indication of its drying property.

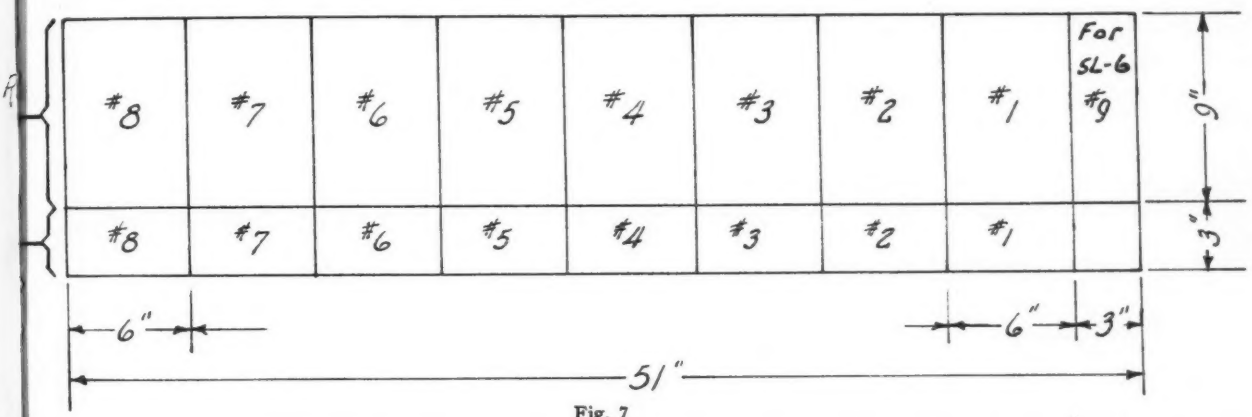


Fig. 7

TABLE 6

Oxidation of Oils on Wool in Fade-Ometer
Loss of Ether Extract in % of Original Oil Used

Number of Oil	1		2		3	4	5		6	7	8		9	10	11	12
Type of Oil	*Linseed Oil*		*Cotton Seed Oil*		*Synthetic Olive Oil*	*Spanish Olive Oil*	*Vegetable Ester*		*Lard Oil*	*Dist. Red Oil*	*Light Petrolatum U.S.P.X.*		*Self Emulsifiable Mineral Oil Lubricants*			
Amount of oil used	10%	3.5%	10%	3%	10%	5%	5%	5%	6%	5%	5%	5%	10%	5%	5%	5%
5 Hours	43.3	49.8	12.7	13.0	....	.4	.2	....	4.6	....	28.6	20.8	....	31.0	14.2	....
10 Hours	61.0	65.0	15.7	22.4	17.1	.2	....	....	7.8	7.5	28.8	33.5	27.1	38.1	23.9	....
20 Hours	76.4	72.3	30.4	29.0	26.9	6.2	6.3	4.0	10.2	....	44.4	40.0	41.2	45.3	42.2	....
40 Hours	78.3	75.1	35.3	33.2	40.3	12.6	11.3	12.6	12.6	16.4	48.8	46.1	55.3	50.0	55.8	72.0
Change of Fatty Acid Content of Ether Extract Per Cent																
Start	5.1	6.9	7.4	6.5	15.2	9.5	8.6	9.3	6.6	90.7	3.2	2.9	8.6	5.5	8.0	8.0
5 Hours	24.1	23.5	15.9	15.6	....	16.0	10.0	....	10.3	93.2	3.8	....	....	10.6	23.4	....
10 Hours	36.6	34.4	18.1	19.9	22.5	19.3	16.4	....	16.0	96.1	2.8	4.3	12.3	13.0	30.4	....
20 Hours	54.4	48.1	26.4	27.3	27.2	22.2	19.5	18.1	16.8	96.8	4.5	5.0	16.3	18.7	35.8	....
40 Hours	59.2	55.5	37.2	32.4	44.8	28.7	29.2	29.1	22.1	109.7	7.2	4.6	21.1	23.6	44.4	38.0

The semi-drying oil like cotton seed oil lost one-third of the original oil in forty hours and the fatty acid content reaches thirty-five per cent and more. A slight stiffening effect of the cloth is noticeable.

The non-drying oils such as olive oil and lard oil are distinguished by the small loss in the ether extractable matter which is less than fifteen per cent in forty hours. The fatty acid content rises to approximately 30 per cent in forty hours. The vegetable ester oil No. 5 belongs in this group as proven by the figures.

The mineral oil in its pure form (such as petrolatum) shows a weight loss which amounts to nearly 50 per cent. It is distinguished from the three previous types of oils in that it hardly shows any increase in the fatty acid content. In some instances even a decrease was noted, which is probably due to the uneven distribution of the oil.

The self emulsifiable mineral oil lubricants (mixtures of mineral oils with various amounts of vegetable and animal oils and other compounds) reflect their composition in two ways. As a group they show a high loss of weight depending on the amount of mineral oil present. It seems that the presence of other compounds has a catalytic action on the petrolatum which is responsible for its much higher loss in forty hours' exposure than when used in the pure form. This is a splendid research project of its own to study the influence of the various compounds on petrolatum and it should be of the highest interest to the manufacturers of such lubricants.

Concerning the change in the amount of the fatty acid we find two types of oils, a slow oxidizing type as represented by oils 9 and 10 and a fast oxidizing type as represented by oil No. 11.

In advertising these types of oils it is apparent that statements like: "absolutely non-oxidizing" are no longer correct.

SPECIFICATIONS FOR OXIDATION TEST

The number of tests made on the twelve different oils is not great enough to warrant the drawing up of definite specifications. But, a tentative outline can be set up in regards to the behavior of the various types of oils based on the available data.

Taking olive oil as the standard, a good substitute for it should show in the Fade-ometer exposure test the following behavior:

1st. The loss in ether extractable matter in the first 10 hours should be less than 10 per cent and in 40 hours not above 20 per cent.

2nd. The fatty acid content of the extracted oil should not exceed 35 per cent in 40 hours.

3rd. No strong discoloration or stiffening of the wool cloth during the exposure time should take place.

Of the oils tested we find that only the vegetable ester and lard oil meet with these requirements. All lubricants containing mineral oil show a much larger loss in ether extractable matter than the vegetable or animal oils. The synthetic olive oil No. 3 tested showed a high loss in ether extractable matter as well as a high fatty acid content. It probably contains some semi-drying oils.

What causes this loss in ether extractable matter? Is it caused by actual evaporation of the oil or is it just a change in the ether solubility of the oil? To find an answer to these questions several oil treated samples were alcohol extracted for two and a half hours after the ether extraction and the following data were found: (See Table 7).

TABLE 7

Change in the Alcohol Extractable Matter Through the Fade-ometer Exposure

No. and Type	*No. 1 Linseed Oil*		*No. 4 Olive Oil*	*No. 5 Vegetable Ester*	*No. 10 Mineral Oil II*	*No. 11 Mineral Oil III*
Start	—	—	1.05	1.06	1.06	—
5 Hrs.	—	—	1.11	1.06	1.12	—
10 Hrs.	—	—	1.10	1.13	—	—
20 Hrs.	—	—	1.09	—	1.13	—
40 Hrs.	1.75	1.66	1.51	1.54	1.85	1.82

It seems that in the case of olive oil and vegetable esters, part of the oil is actually changed to an ether insoluble substance and can be accounted for in the increase of the alcohol extract. In the case of the lubricants containing mineral oil, there is hardly an increase in the alcohol extract noticeable before the forty hours' exposure and here only about 50 per cent of the oil loss was found in the alcohol extract. Therefore, it appears that part of the oil actually evaporates.

Tests now in progress indicate that a second weak point exists in the Fade-ometer, namely the variation in the temperature of the cloth under exposure. There were variations during each test as well as between the various tests:

Per example, the following variations were found:— temperature next to thermostat measured with the thermometer hanging free 92-99° F., temperature on exposed surface of cloth with bulb of thermometer in contact with cloth 142-179° F., temperature of under surface of cloth 105-148° F.

4. SCOURABILITY

The ease by which various oils may be removed from the top yarn or a fabric through scouring is tested by the amount of oil present before and after the scouring processes, by means of the Soxhlet extraction. For worsted oils it is absolutely necessary that they can be removed in the backwashing operation. In the English System the carded sliver is normally backwashed before combing whereas in the French system the top is backwashed after the combing operation. The mill trials described in here were all made with French Top.

The backwasher consists normally of two small scouring bowls of three hundred liter capacity. The first bowl contains a soap liquor with one gram flake soap per liter whereas the second bowl is used as a rinser and no scouring

agent added. The scouring temperature is kept, in both bowls, around 40° C. (100° F.). A pair of squeeze rollers after each bowl is the only mechanical action applied to the sliver when it passes through the machine. The sliver is in actual contact with the liquor for approximately twenty seconds in each bowl. The total scouring time including the squeezing operation is not more than one minute. Then the sliver passes right on into the dryer. The production of a modern backwasher is approximately two hundred fifty pounds of top an hour.

The amount of lubricant normally added for French carding and combing is 1 per cent to 2 per cent. This amount of oil must be entirely removed in backwashing for two reasons:

1. To enable the dyer to produce an even dyeing in case the top must be dyed.
2. To enable the spinner to calculate accurately the amount of lubricant necessary for the drawing process.

The action of the backwashing is very easily ascertained by the determination of the ether extractable matter before and after the process.

The behavior of olive oil, vegetable ester and mineral oil No. 2 were tested on a commercial scale in the carding and combing operation and the following data found in backwashing, as seen in Table 8.

TABLE 8
Removal of Oils Through Backwashing

Oil Used	*Ether Extraction*	
	Before Backwashing	*After Backwashing*
No Emulsion	0.57%	0.48%
Olive Oil Emulsion.....	2.04%	0.47%
Vegetable Ester Emulsion.....	2.02%	0.46%
Mineral Oil Emulsion No. 10..	2.04%	1.87%

Each figure represents the average of six tests taken over a period of several days. Whereas olive oil and the vegetable ester were removed 100 per cent, less than 10 per cent of the mineral oil was removed. As in the case of the oxidation a laboratory washing test is needed for judging the scourability of worsted lubricants.

Two procedures were tried to establish such a method.

First: Washing trials were run in a regular home washer of the paddle type. Test samples were prepared in a similar manner as for the ageing test. The tests were not very successful as the differences between olive oil and mineral oils were not decisive enough nor was the olive oil removed 100 per cent as in the case of the backwasher.

Second: In the Launder-Ometer we have the accepted standard machine, of the American Association of Textile Chemists and Colorists, for the determination of color fastness. Trials were made in this machine. The standard pint jars used in this machine have a capacity of four hundred cubic centimeters of liquor.

The first tests were run with eight gram samples, impregnated with 5 per cent of olive oil, on piece goods as well as on skeins, which were washed for five and ten minutes, in a soap solution of one gram per liter. From the cloth less than 30 per cent of the oil was removed whereas from the skeins approximately 80 per cent of the oil was removed. Hardly any change was found between five and ten minutes. From this preliminary test the following washing procedure was established.

Material: Loose twisted worsted yarn (knitting yarn type.)

Size of sample: 4 grams.

An eight gram skein is soaked in a dish in 40 c.c. oil-ether solution until all oil is taken up and the ether evaporated. Then the skein is divided in half to run parallel tests.

The soap liquor is 400 c.c. containing .4 gram neutral soap flakes, 1 gr./L.

The temperature of the bath is kept at 40° C. and five small steel balls of approximately 1 gram each are added with the yarn to help in the mechanical action.

The running time is set at 5 minutes.

After the completion of the scouring the skeins are rinsed two times in warm distilled water (30° C.), one time in cold water, then squeezed through a wringer twice and dried.

In Table 9 we have the data gathered in this test from seven different oils. In the interpretation of this data we find that olive oil, vegetable ester and lard oil are removed nearly 100 per cent. In the case of mineral oil lubricants of the slow oxidizing types, No. 9 and No. 10, less than 40 per cent was removed and from the fast oxidizing types, No. 11 and No. 12, approximately 50 per cent of the original oil was removed. Before an oil can be considered as an acceptable substitute for olive oil the percentage of removable oil by this test should be more than 90 per cent. This is very important for a good worsted oil.

TABLE 9
Wool Lubricant Washing Test in Launder-ometer Ether Extractable Oil After Washing
Oil Content of Yarn Before Washing 3%

Number of Oil	4		5		7		9		10		11		12	
Type of Oil	*Olive Oil*		*Vegetable Oil*		*Lard Oil*		*Mineral Lubricants*							
	Residual Oil Per Cent	*Per Cent of Oil Removed*	*Residual Oil Per Cent*	*Per Cent of Oil Removed*	*Residual Oil Per Cent*	*Per Cent of Oil Removed*	*Residual Oil Per Cent*	*Per Cent of Oil Removed*	*Residual Oil Per Cent*	*Per Cent of Oil Removed*	*Residual Oil Per Cent*	*Per Cent of Oil Removed*	*Residual Oil Per Cent*	*Per Cent of Oil Removed*
Test No. 1	.21	93.0	.23	92.3	.19	95.7	1.86	37.8	2.22	36.0	1.46	51.4	1.55	48.3
Test No. 2	.04	98.7	.12	96.0	.12	96.0			2.09	30.3			1.49	50.3
Test No. 3	.13	95.7	.18	94.0										

The difficulties of removing mineral oils from wool were especially studied by Speakman. He established that the difficulties increased with the chain length of the hydrocarbon molecules or with the boiling point of the oils. But the true cause of the difficult scouring lays, in his opinion, in the high oil water interfacial tension. When the surface tension of the mineral oil is reduced without at the same time increasing the adhesion the scourability of the mineral oil may be improved. Of the compounds capable of performing these functions he found oleyl alcohol especially suitable. He found a marked improvement in scouring by using a mineral oil together with 6 per cent by weight of oleyl alcohol.

To study the influence of oleyl alcohol ($C_{18}H_{33}OH$) on the scourability of mineral oils, tests were conducted with mineral oil lubricant No. 10, which shows the poorest scourability in the above test and also in the practical mill trials. Six skeins were treated with the straight mineral oil lubricant and six skeins with a mixture of 94 per cent mineral oil lubricant No. 10 and 6 per cent of oleyl alcohol. All twelve skeins were run in the Launder-Ometer at the same time and the results are tabulated in Table 10. Without a doubt, the scourability was improved through the presence of oleyl alcohol, but by no means to such an extent that we can call this oil suitable for worsted carding and combing. Why this difference with Speakman's experiences? Speakman used a two-fold scour and used soap and soda as scouring agents whereas in this test only soap solutions were used. Practical experiences have proven that quite a number of the mineral oil lubricants on the market today may be easily removed in the soap soda scouring process, as used for piece scouring, when carefully controlled.

TABLE 10

Influence of Oleyl Alcohol on the Scourability of Mineral Oil

	Mineral Oil Lubricant No. 10	
	Without Oleyl Alcohol	*With 6% Oleyl Alcohol*
Before washing	3%	3%
After washing	2.14%	1.83%
	2.51%	2.02%
	2.16%	1.80%
	2.26%	2.24%
	2.59%	2.13%
	2.87%	1.50%
Average	2.42%	1.92%
Per cent of original oil removed	19.3%	36%

The scouring was performed right after the application of the oils to the wool which, naturally, in practice will not be the case. Therefore the research on scouring has to be extended to samples which are stored a certain period and samples which are exposed in the Fade-Ometer.

CONCLUSION

From all the data gathered in this paper we are able to prove that the peculiar situation in the olive oil market is not so hopeless as it seems, especially for the manufacturer of fine worsted goods. We have to give credit especially to the English research workers like Professor Speakman and his associates for establishing the fundamental facts underlying the lubrication of wool. Using this English research work as a foundation we are able by carefully laid out mill trials to judge the merit of proper lubrication during the manufacturing process of worsted as well as woolen yarns.

Whereas it is comparatively easy for the mill man to form a correct opinion about the lubricating properties in the carding and spinning processes of an oil it is much more difficult to judge the ageing properties of an oil. The author was able to describe in this paper a new ageing test based on the use of the Fade-Ometer, which gives in forty hours of exposure the same result as heretofore required a one year storing test. This new test should be of much higher value than the Mackey test as it reproduces far nearer the changes in oils as they occur in the actual mill processes. The new method may also be used for the determination of the amount of mineral oil in self-emulsifiable wool oils.

To test the scourability of the oils, which property is of special importance for worsted oils, a sample laboratory scouring test by using the Launder-Ometer was developed. By this method we are able to duplicate the action of the backwashing process. It is therefore a great time as well as material saving test which is much easier controlled than a practical mill trial. The test may also be developed for judging the scouring power of various scouring agents.

For the interpretation of the data obtained by these two new tests the following tentative specifications are used to decide if an oil is up to the olive oil standard.

Ageing Test:

1st. The loss in ether extractable matter in the first 10 hours should be less than 10 per cent and in 40 hours not above 20 per cent.

2nd. The fatty acid content of the extracted oil should not exceed 35 per cent in 40 hours.

3rd. No strong discoloration or stiffening of the wool cloth during the exposure time should take place.

Washing Test:

1. Ninety per cent or more of the oil originally put on the yarn must be removed.

By comparing the different substitutes tested in this paper with the Spanish olive oil, manufactured vegetable esters are well within these specifications. They are in their general properties, no doubt, equal to high grade olive oil. As they contain no mucilage, they will be even superior in their uniformity. Lard oil also meets the set specifications but with lard oil the difficulties are, that even the best winter strained oil, has an amount of stearic acid which makes the oil sticky and unsuitable for worsted spinning. Shipments received during the winter are frozen

and much trouble is encountered to bring it back to a liquid state for proper storage.

The drying and semi-drying oils are distinctly recognized by their high loss in ether extractable matter and the high increase in the fatty acid content.

The mineral oil lubricants are especially objectionable to the worsted spinner because of their low scourability. Even when the increase in the fatty acid content is low they are recognized by the high loss in ether extractable matter.

The oxidation test indicates that in respect to mineral oil lubricants it may be worked out as a quantitative method for determination of the mineral oil content in oils of this type.

In introducing these two methods it is felt that while they are not yet perfected to the highest extent they will give the textile chemist a valuable tool for which he has long been searching, to judge properly the wool lubricants on the market. They should also, on the other hand, help the manufacturer of wool lubricants in the improvement of their product.

In closing I have to extend special thanks to my two assistants, Elmer McCabe and John Hintermaier, for their valuable work in developing these tests.

TECHNICAL NOTES FROM FOREIGN SOURCES

Waterglass Soaps in the Textile Industry

Dr. A. Foulon—Monats. f. Textil-Ind. 51,104 (1936). —Soaps containing sodium silicate have been long known and highly valued, and actual work with them over long periods of time has confirmed the high reputation given to them in technical and trade circles. In view of the situation regarding soaps in general (for industrial and domestic purposes) in Germany at the present time (the oils and fats needed for their production having to be imported to a large extent from foreign countries), the situation, in reference to the improvement of ordinary soaps by addition of such assistants as waterglass, in order to increase their effectiveness per unit of weight, cannot be regarded as other than acute.

The choice of suitable additive compounds for an ordinary soap is not a large one; besides sodium silicate, alkali carbonates, especially sodium carbonate, and potassium chloride have been proposed and used. While the alkali carbonates might be considered valuable for some purposes, potassium chloride cannot be considered as suitable for any purpose in this reference. The one absolute condition which must be laid down as to the use or non-use of an assistant in soaps is, that the detergent effect, and the physical properties of the goods treated, be not harmed, but on the contrary improved.

Now, according to this precondition, we must recall that, under some circumstances, the true value of a detergent may be depressed, as, for example, through the use of hard water. Waterglass, with its own colloidal nature, forms, with the compounds which makes the water hard, hydrous gels, not crystalline precipitates, as sometimes stated, a fact which can be confirmed by examination of such precipitates under the microspoce. Calcium carbonate, on the other hand, is obviously crystalline. When a pure soap is employed with hard water, a serious amount of it is used up in softening the water; with soaps containing waterglass, the silicate accomplishes the softening of the water to a large extent, thus saving a good deal of the soap for its proper purpose as a detergent.

The incrustations which form upon goods washed with ordinary soaps in hard water are principally lime soaps, calcium carbonate, and when waterglass is present, calcium silicate. The lime soaps affect the appearance of the goods unfavorably; the calcium carbonate, as a consequence of its crystalline nature, diminishes the strength of the fiber; while calcium silicate, being of colloidal nature, does not exert a harmful, but a distinctly favorable effect upon the goods. The result of addition of waterglass to a soap is therefore of twofold nature; it saves soap when hard water is being used, and preserves the desirable physical properties of the goods. When we recall that, with the use of soap alone, only a relatively small amount of the soap is used for its proper purpose of cleansing, while all the rest of it is wasted in softening the water and neutralizing acid contaminants, as sweat, etc., while waterglass, if present, would take care of these intrusive functions, it would appear only rational to employ some waterglass with the soap as a matter of routine practise. In the United States, more and more soap is being used, containing electrolytes such as soda or waterglass, and not because of any difficulties with a sufficient supply of oils or fats, but solely on the ground of the better results obtained. And statements still made now and then, to the effect that deposits of calcium silicate in the fiber must ultimately weaken it, because of the cutting effect of the tiny "crystals" of calcium silicate, appear absurd, in view of the absolute demonstration of the fact of calcium silicate not forming crystals, but existing as a hydrated colloid, as can be shown by a single examination under even a cheap microscope. Actual tests are on record, showing that goods cleansed with waterglass soaps lose distinctly less tensile strength than do the same goods cleansed with either the same soap alone, without a content in sodium silicate, or with the soap in conjunction with sodium carbonate and without waterglass.

Complaints are also made, now and then, that waterglass soaps exert an unfavorable influence upon linen goods. This view also has been shown to be incorrect. It has been proved by Kind that physical as well as chemical influences are involved in the question of loss of strength of textile materials. Linen yarns possess only a slight

twist; the "fibers" are really long bundles of true fibers cemented together by pectin-substances. If, in cleansing, this agglutinative material is more or less removed, the separate fibers are no longer so closely adherent, and hold together only by surface-adhesion in some extreme cases. The "body" of the yarn becomes too slight. Cotton fibers, on the other hand, are much more tightly twisted together in the yarn, and hold together by a much greater degree of surface-adhesion; the cotton yarn holds its body. Now, such a matter has nothing to do with the cleansing agent; the worker has only to consider the length of the washing, the amount, concentration, temperature, etc., of the bath, to get results which are satisfactory, and to remember that a plain soap bath, if carelessly used, will produce the same undesirable results which he may have complained of as inherent in the use of a waterglass soap.

The favorable action of waterglass in a soap is a result, first, of the presence of hydroxyl ions in the wash-liquor, and second, of the adsorptive power possessed by colloids, in that these colloids remove the grit and dirt from the fiber and carry it away. This fortunate combination of colloidal adsorption and emulsification is the chief reason for the value of silicates in a soap. As a mild alkali, waterglass increases the detergent action of the soap, just as does soda. But, further, as a result of penetrative action, it brings about an intimate penetration of the wash-liquor into the goods, and acts, as a colloid, as a suspensive and dispersive agent upon the solid, gritty contaminants. Simultaneously, the amount of foam is increased, and the foam, the "suds," made more stable by the silicate. The surface tension, and the interfacial tension, of the soap solution are not altered by the silicate. Iron and manganese are so separated from the water (if it contains such impurities) that they can afterward be easily removed by rinsing (a kind of indirect bleaching, since by the removal of the compounds of these heavy metals the goods will not afterward become yellow upon drying).

Still further, the hindering of corrosion of metal vessels or fittings by the presence of silicate in the soap-liquor is not to be undervalued. An addition of from 0.5 to 2.0 per cent of waterglass completely inhibits the corrosion of aluminium (so much used in the construction of domestic mechanical washers) by even a 10 per cent soap solution, completely. And nothing should need to be said as to the stabilizing action of waterglass upon bleaching agents involving oxygen (peroxides, etc.), or upon soaps themselves (inhibition of rancidity).

As to the softening action of silicates upon hard water, the valuable part of such action depends upon the fact that they react with the lime salts in the water, to form calcium silicate, more rapidly than soda reacts with the lime salts to form calcium carbonate. And, further, the calcium silicate tends to remain colloidally dispersed in the water, so that it is easily washed away as a soft, slippery, hydrated gel; while lime soaps stick tenaciously to the fiber and cannot be removed by rinsing (or even scrubbing, if such a means were allowable in many cases). Soaps containing waterglass dry out hard, so that they do not dissolve too rapidly; and the less waste in the amount used is another factor to be considered.

Potassium chloride is not suitable as a filler for soaps; it has no detergent properties, it makes the soap less resistant to too rapid solution, and the soap, if allowed to dry out, becomes too hard too rapidly. There seems to be no point to its use.

TRADE NOTES — NEW PRODUCTS

• DOMINION ANILINES

Dominion Anilines & Chemicals, Ltd., announce that on June 1st they will move into new quarters at 265 Adelaide Street, West, Toronto, Ontario, Canada. The new location provides spacious offices, a larger and improved laboratory and increased shipping facilities.

• NEW PRINT BLANKET

Mr. Paul Hodges of Dewey and Almy Chemical Company, Cambridge, Mass., has developed a new kind of print blanket with an embossed surface that is said to permit the complete elimination of back grays. Neither is it dependent upon the careful lapping on the cylinder to conform to the width of the cloth being printed.

The blanket is made from latex-impregnated fabrics. Its unique construction includes an especially embossed surface reenforced in such a way that the indentations are said not to collapse or flatten under the heavy pressure applied by the engraved (print) cylinder. This permits the elimination of the back gray, for the blanket always supplies sufficient storage voids to pick up and carry away the surplus color which strikes through the cloth being printed or which extends beyond its selvages. As soon as the blanket leaves the printing position, it is thoroughly washed and dried on each revolution.

With this new print blanket close register is not considered, as the embossed surface picks up the excess color and carries it away in the same manner as back grays. There is no squeeze-roll ball of color accumulating at the selvage edge of the cloth being printed and therefore no flushing of color along the edges.

In order to insure the complete success of the new blanket, a new washer and dryer have been developed. Entirely new principles are employed, and drying cans are completely eliminated. Excess temperature is said to be avoided, which greatly increases the length of life of the belt surface.

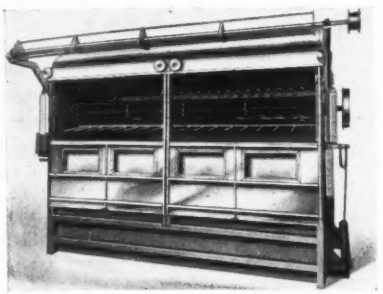
In this new machine the ink-cover belt is first water-washed and then passes past an air-blast chisel, which removes the bulk of the free surface water. The blanket then passes through an air-drying compartment in which all remaining water is removed at a low temperature. It is the simplicity of the new blanket and the modern design of the washing machine which is said to permit operating speeds of up to 120 yards per minute, with an attendant increase in production capacity.

In the silk and rayon printing industry this new development is said to offer yet another saving in reducing the expense

of the inks used—an economy readily appreciated by printers in this field.

• NEW DYE KETTLE

The machine illustrated is one of two such machines built by Riggs & Lombard, Inc. of Lowell, Massachusetts for a well-known worsted mill. This is one of the largest stainless steel dyeing kettles ever built, having sufficient capacity to handle 1600 lbs. of men's wear worsteds in one batch. The kettle proper is made of solid



stainless steel and the enclosure also is of stainless steel. This machine is said to make possible great economies in production and also offers the usual advantages that go with stainless steel construction.

• CREPE RESEARCH FABRICS

Many contributors to the Rayon Crepe Research Program attended a private showing during the last week of April of experimental fabrics made in connection with the Rayon Crepe Research being sponsored by the American Association of Textile Chemists & Colorists, the Textile Foundation, Inc. and the Throwsters Research Institute, Inc.

The exhibit was held at the laboratories of the United States Testing Company, 1415 Park Avenue, Hoboken, N. J. who provided the examining machine and fabric inspection room facilities.

The fabrics had in them numerous effects of pebble, in varying degrees, created by intentional variations in the processes in throwing and weaving plants. W. F. Macia, the Research Fellow discussed the methods by which these fabrics were processed.

Representative samples of the fabrics made from each lot will be displayed at the Throwsters Research Institute, Inc., 468 Fourth Avenue within the near future for the benefit of the general industry.

• NOPCO CHIEF CHEMIST

Appointment of Ernest Segessemann, a member of the laboratory staff of the National Oil Products Co.'s Harrison, N. J. plant, as chief chemist of the company's new plant at Cedartown, Ga., was announced recently by Ralph Wechsler, treasurer and technical director of the firm.

"Mr. Segessemann has been with the company a great many years," Mr. Wechsler said, "and is familiar with the entire subject of production, plant control and analytical procedure."

• MAY TEXTILE RESEARCH

An "inside story" in simple terms of the physicist's attack on the problems of fiber structure is an unusual feature of *Textile Research* for May. "Unusual," because the normal function of this magazine is the publication of textile research results, whereas Prof. E. R. Schwarz in his illustrated article, "Textile Fibers in the Light of Modern Science," interprets in non-scientific language previously reported scientific findings and methods, largely of Fellows of the Textile Foundation. The close parallel that exists between the structures of fabric, yarn, fiber and fibril is cleverly emphasized and tends to heighten interest in the instruments and techniques that are necessary for such research. Analogy is skillfully utilized to clarify abstruse scientific facts. The result is a story that should prove as interesting to the textile executive as to the student. It will be concluded in the June issue of *Textile Research*, and then be made available in reprint form by the Textile Foundation.

Few scientific treatises published by this magazine have attracted such general interest and requests for reprints as that by Dr. Albert C. Walker of Bell Telephone Laboratories on "Moisture Adsorption in Cotton and Other Fibrous Insulating Materials." In the concluding instalment he proposes a theory to explain the dependence of the electrical properties of textiles upon their moisture adsorbing properties. Dr. Walker has kindly consented to act as a member of the Administration Committee for the research on textile drying of U. S. Institute for Textile Research at the National Bureau of Standards. The recent conference of the 50 co-operators in the financing of this study, at which the final research program was discussed, is reported in this issue.

• RANCIDEX

A rancidity retardant for vegetable and animal oils, fats, waxes, etc., has just been introduced by the Glyco Products Co. Inc., 148 Lafayette St., N. Y. C., under the name of Rancidex.

This material is recommended by the manufacturers for the retardation of rancidity, discoloration due to oxidation, etc., for all non-edible preparations where animal and vegetable fats and oils are used. Rancidex is suggested for use in the textile, leather, lubricant, cosmetic and other industries where rancidity, "souring" and discoloration due to oxidation are constant sources of worry and annoyance.

• TEXTILE SCHOOL DEANS

A practical discussion of the relationship between textile schools and the industry they serve was one of the principal features of the semi-annual conference of textile school deans held under the auspices of the Textile Foundation at Grove Park Inn, Asheville, N. C., April 12 and 13. Frederick M. Feiker, who conducted the educational survey for the Foundation and who continues in an advisory capacity, presided at the meeting. Stuart W. Cramer, a director and the treasurer of the Foundation, was present and participated in the discussion. Franklin W. Hobbs, chairman of the Foundation, was unable to attend. This was the first of the series of semi-annual conferences he has missed. Edward T. Pickard, secretary of the Foundation took an active part with Mr. Feiker in the direction of the meeting.

Speaking first for the school deans, President Chas. H. Eames of Lowell Textile Institute urged manufacturers to continue their interest in the educational institutions in the industry; to take graduates into their mills and follow their progress carefully; and to stimulate research in the schools by bringing their problems there and "exerting pressure" on members of the instructing staffs to carry on such research.

Mr. Cramer, speaking for the Foundation and the industry, stated that he was deeply interested in this educational movement as one of the most important the Foundation is sponsoring. He recognizes in this movement an opportunity for the adjustment of differences of opinion on educational procedure, and consequently for the development of a coordinated approach to the problems involved.

William B. McLaurine, Secretary of the American Cotton Manufacturers Association, in an inspirational talk raised the question whether the schools were selecting their undergraduates carefully enough and, particularly, whether they were preparing their students to do certain specific jobs. "Don't graduate a student unless you and he have some idea where he is going from there," he advised.

Mr. McLaurine also recommended particular attention to research and to the study of industrial relations. The latter problem, he said, is "a great complexity that has come very much alert and alive in the last few years; you can be as indifferent to it as you like, but it still stands there."

Douglas G. Woolf, editor of *Textile World*, lauded the textile school program as the most important movement sponsored by the Foundation. He pointed out that textile manufacturers are now seeking young executives and are willing to pay good salaries for them—an indication that there really is promise for those who now enter the profession of textile engineering through the textile schools. He also urged the development of teaching material on the subject of industrial relations.

Replying to the latter suggestion, Dr. A. H. Williams of the Wharton School of the University of Pennsylvania pointed out that a section of the text on economics which has been developed under the sponsorship of the Foundation deals with industrial relations and could be used as a basis for further treatment.

Dr. Williams' presentation of these teaching materials on textile economics was another of the main features of the conference. They cover four subjects: Economics in general; management; marketing; and textile costing. Intensive consideration of the text on the latter subject occupied a good part of the meeting.

Dr. B. F. Brown, dean of the Economics Department of N. C. State College, led a discussion on the teaching of textile economics. At that session, the meeting also explored the possibility of conducting a 10-day seminar in New York for the men from the economics department who would handle the economics text. The proposal was received most favorably by all present, and has been referred to the directors of the Foundation for consideration.

Another important project undertaken by this group—that of the development of the technical texts for the teaching of production methods—was reported on by H. H. Willis, dean of the textile school of Clemson College.

The success of the conference was largely due to the active participation of the textile school deans in the discussion. Those in attendance were: E. W. France, Philadelphia Textile School; Chas. H. Eames, Lowell Textile Institute; Henry W. Nichols, Bradford Durfee Textile School; George Walker, New Bedford Textile School; W. D. Fales, Rhode Island School of Design; Thomas Nelson, North Carolina State College; H. H. Willis, Clemson College; C. A. Jones, A. French Textile School, Georgia School of Technology; E. W. Camp, Alabama Polytechnic Institute; J. B. Bagley, Texas Textile School; and M. E. Heard, Texas Technological College. Col. John W. Harrelson, Dean of Administration, North Carolina State College, was a guest of the conference.

● ACHEMA ANNUAL

The Achema Annual 1937, a profusely illustrated book which has 388 pages will review with practically no omission the many products for scientific and industrial purposes of the German Chemical Apparatus and Plant Building Industry as these products will be shown at the Achema VIII Chemical Engineering Exhibition. As is generally known this Exhibition will be held from July 2 to 11 at Frankfort-on-Main on the occasion of the National Convention of German Chemists. It is stated that this Annual in a most thoroughgoing and well arranged manner prepares the visitor for what he will see at this greatest of Chemical Engineering Exhibitions. The multitude and variety of the apparatus, plant equipment, machines and accessories exhibited in seven halls with about 175,000 square feet floor space make a careful study and systematic preparation practically indispensable if one really wants to make the most of one's stay at Frankfort-on-Main.

The Achema Annual 1937 is supplied free of charge to those who have registered their visit to the Achema VIII in advance. Only three international reply coupons need be sent to cover postage. Prospective visitors to the Achema VIII may now register in advance at the Dechema German Society for Chemical Engineering, 103a Potsdamerstrasse, Berlin W.35.

● PURCHASE COLOR COMPARATORS

The Marshall Field & Company, Manufacturing Division has purchased two Hays color comparator machines from the Hays Laboratories in Pawtucket, R. I. for use in the Bureau of Style and Design. It is stated that these machines will eliminate the guess work in the color ensembling of coordinated merchandise. The Hays color comparator is a scientifically designed electrical instrument employing photo-electric cells for the purpose of matching colored textiles. The instrument measures the depth of color and its tone. It is claimed that the color values as shown by this instrument are in precise percentage of reflection; consequently, it is possible to develop a color and adapt it to various different textures and have them match exactly.

In developing harmonious color contrasts it is important to have the same degree of intensity in both shades and this instrument determines the tone value to an exact degree.

Once a color is developed and its constituents determined by this instrument it is plotted in graph form and filed so that at any time in the future this same color may be developed again.

● NEW FLAME-PROOFING CHEMICAL

A new flame-proofing agent for textiles and paper just developed by the du Pont Company was demonstrated on March 31 at the du Pont Exhibition held under the auspices of the Museum of Science and Industry in New York City. Textiles and paper treated with this new chemical are said to be highly flameproof, and at the same time to have a soft, pleasing "feel." In addition, it is claimed that this new chemical does not have any appreciable influence on the strength of textiles and paper, or on the dyestuffs commonly used. In announcing this new chemical, it is pointed out that textiles and paper treated with fire retardants are not fire-proof in the sense that they cannot be burned, but are flameproof in that they do not blaze or smolder, and accordingly will not spread a fire.

During recent years much research has been directed to the development of a satisfactory flame-proofing agent for textiles and paper, but up to the present all materials used for this purpose have had certain disadvantages which limited their usefulness, it is stated.

The du Pont Company expects to begin the manufacture of this new material on a commercial scale in the near future.

● TRADE IN COAL-TAR DYES

Foreign trade of the United States in coal-tar products has been characterized during the current year by heavier exports of benzol, creosote, rubber compounding agents, and intermediates and larger imports of foreign acids, creosote, intermediates, dyes, colors, and crudes, particularly naphthalene, according to C. C. Concannon, Chief of the Commerce Department's Chemical Division.

It is significant that the United States, which prior to the World War was almost entirely dependent upon foreign countries for its dyestuffs requirements, is now exporting more of these products both in quantity and value than is imported, Mr. Concannon stated. Our dye imports are now confined very largely to specialties, which individually are imported in relatively small quantities, chiefly from Germany and Switzerland, according to Mr. Concannon.

Imports of dyes, colors, stains and similar products during the first quarter of the current year aggregated 976,000 pounds, valued at $1,553,000, against 834,000 pounds, valued at $1,168,200, in the first three months of 1936, preliminary statistics indicate. This increase reflects to some extent the current record activity of our textile industries, which also no doubt accounts in part for the decline in our dye exports—the normal export being reduced by the demand from our domestic consumers.

Exports of dyes, colors, stains and color lakes during the first quarter of the year were recorded at 5,133,000 pounds, valued at $1,793,000 compared with 6,210,000 pounds, valued at $1,979,500, in the corresponding months of last year. While our dye imports originate almost entirely in Germany and Switzerland the total being about equally divided between the two, our exports of such products are widely distributed.

Although China, Canada, British India, Belgium, the Netherlands, Mexico, Japan and the Argentine are our outstanding markets for such products, records show that shipments went forward to a total of 78 countries in 1935, according to Mr. Concannon.

● ANNUAL CONVENTION

The sixteenth annual convention of the Delta Kappa Phi Fraternity was held on May 1, 1937, at Philadelphia, with several hundreds of members present. This oldest of textile fraternities had as host its active chapter at the Philadelphia Textile School.

Saturday morning was spent in a tour of the school and of various points of interest throughout the city.

The business meeting was held in the Crystal Room of the Hotel Walton on Saturday afternoon. The following supreme officers were elected for the coming year:

President, R. Allan Watson, Vice-President, Joseph E. Goodavage; Treasurer, H. Gardner Battles; Secretary, A. W. France.

In the evening, a formal dinner and dance was attended at the Arcadia restaurant, which nicely rounded out a pleasant, well-planned day.

The place of convention for next year has tentatively been set for New Bedford, the home of Delta chapter at the New Bedford Textile School.

● INCONEL-CLAD STEEL

A new and lower base price of 25c per pound for Inconel-Clad Steel was recently announced by Lukens Steel Company, Coatesville, Pa. At the same time, a new list of standard extras was also issued. Inconel-Clad Steel is a bi-metal steel plate consisting of a light layer of Inconel bonded to a heavier layer of ordinary steel.

Inconel is an alloy of nickel, chromium and iron. Its composition is approximately 78 to 80 per cent nickel, 12 to 14 per cent chromium, and 6 to 8 per cent iron. It was selected from a range of experimental alloys as that one presenting the most favorable combination of corrosion resistance, strength, and working properties together with freedom from unfavorable, attributes to suit certain modern needs.

Lukens Inconel-Clad Steel is claimed to have high resistance to corrosion for equipment handling such materials as fatty acids, photographic fixing solutions, certain synthetic resins, highly acid fruit and food products, and oxidizing acids as encountered in some types of textile dyeing and other processes.

Inconel-Clad Steel is produced in much the same way as Nickel-Clad Steel. The properties of the bond, the ease of fabrication, and the conditions of economical use are closely parallel with Nickel-Clad Steel. Of course the corrosion resistance is that of Inconel Metal rather than Nickel. Strengths are said to be slightly higher and welding facility is equal to that of Nickel-Clad Steel.

Plate 3/16" and heavier, up to 120" in width, and 264" in length, with cladding of 10, 15 or 20 per cent is readily obtainable. 5 per cent cladding may be had on ½" plate and heavier. Special larger sizes will be quoted on request.

● NEW SOLUOL LOCATION

Soluol Corporation, manufacturers of textile oils and chemicals, now located at 123 Georgia Avenue, Providence, R. I., is moving from that location and will, beginning June 1st, occupy new quarters at 225 Chapman Street, Providence, R. I.

The new building to be occupied by them was recently purchased through a subsidiary holding company, and is a modern four-story brick and concrete structure.

Alterations have been in progress since the purchase of the building last month, and new additional equipment is now being installed. Moving operations are expected to begin shortly, and the new plant will probably be in full operation by June 10th or 15th.

The new quarters will afford substantially more manufacturing and storage space, to provide for increased production requirements on present products, as well as on new products recently developed and which are expected to be put on the market in the very near future.

● NOPCO PLANT OPEN

The new $1,000,000 plant of the National Oil Products Company at Cedartown, Ga., opened on May 22nd at full capacity for production of products used in the paper-milling textile, leather and other Southern industries.

A construction and renovation program has been under way at the 52-acre, 10-building plant since its purchase last January from the U. S. Finishing Company. At that time, Charles P. Gulick, president of the National Oil Products Co., announced that "nearly $1,000,000" would be invested in the plant. All of the NOPCO products will be completely manufactured in the Cedartown plant. It is second in size only to the Harrison headquarters. Complete laboratory facilities of the plant will be open for the needs of Southern business, Mr. Gulick explained. He said the laboratories will be equipped with materials that would have been termed "chemical curiosities" a few years ago.

● RAYON EXHIBIT

At the dedication of the new building of Mellon Institute in Pittsburgh, May 5-9, there was arranged on the lower floors of the building a series of 40 exhibits, illustrative of investigations now in progress at the Institute. During this dedicatory period the building and exhibits were inspected by more than 30,000 persons.

Among the exhibits was that of the Multiple Industrial Fellowship on Rayon (Dr. W. B. Burnett, Senior Fellow), maintained by the Tubize Chatillon Corporation. This exhibit displayed both the viscose and acetate processes for rayon production, by means of illuminated flow sheets containing samples, and showed a detailed diagrammatic spinning machine for each process. Typical rayon fabrics were draped in the center of the exhibit.

During the inspection period a continuous series of short talks on the production of rayon was given and, judging from the numerous inquiries received, there is an intense popular interest in rayon. Of the manufacturing steps involved the actual spinning operation had the greatest appeal.

● NEW YORK OUTING

Announcements have been distributed covering the details of the annual Outing and Golf Tournament of the New York Section of the A.A.T.C.C. and its many friends. The meeting will be an all-day affair, rain or shine, at the North Jersey Country Club, Paterson, N. J., on June 11th.

Golf will be in charge of Paul Dunkel, tennis under the direction of Rowland Williams and horseshoe pitching led by Robert F. Holoch. Dinner with entertainment will be served at 7 o'clock, tickets for which may be obtained from Geo. L. Baxter, 40 Worth St., New York City. Dinner tickets are being distributed in advance in order to insure satisfactory service to all.

Through the generosity of many corporations in and close to the industry, an unusually large collection of practical and attractive prizes is being provided and everyone in attendance at the dinner is eligible to receive one.

Arrangements for the occasion are in charge of a committee consisting of A. J. Royce, Chairman, Henry Herrmann, George L. Baxter, P. J. Kennedy and Ephraim Freedman.

● JOINS SHERMAN CO.

W. H. Hand has resigned his position as dyer with the Wrenn Hosiery Mills, Thomasville, N. C., to become Southern representative of the George E. Sherman Co. of Brooklyn, N. Y., manufacturers of oils, soaps, finishes and bleaches.

● RESEARCH ILLUSTRATED

Research Illustrated, Textile Edition, for April, 1937 has recently been distributed by E. F. Houghton & Co., Philadelphia, Pa. This is the second textile edition of this Houghton publication and represents the results of considerable thought and effort on the part of its editors and technical staff. It is an attractively prepared booklet and among the contents are listed the following subject titles: A Study of Rayon Crepe; What System for Rayon Sizing — Cotton or Silk?; The Role of Softeners in Cotton Warp Sizing; Pitfalls in Silk Soaking; Blending Rayon and Wool; Beware of Today's Olive Oil.

Copies of *Research Illustrated* are available upon request to the Houghton Co.

● EIGHTIETH ANNIVERSARY

In commemoration of their eightieth anniversary, T. M. Duché & Sons, Inc. have prepared a booklet which has recently been distributed. The booklet traces the history of this company from its beginning in 1857 in London by Tristan-Mathieu Duché, a lawyer and statesman, up to the present. The first American office was opened in New York at 80 Broad Street in February 1879. The growth of the business in this country from its inception necessitated four removals until occupancy of the building at 117-119 Hudson Street was assumed in March 1935. During this period the American branch at New York opened branches in Boston, Chicago and Cleveland and established sales representation in other cities. On June 1, 1930, the American branches were incorporated into an independent unit, the chief purpose of this step being to provide a means whereby the managers and the staff could become financially interested in the business. A number of interesting facts about the early days of the company and its personnel are also included in the booklet.

● PNEUMONIA AND DYESTUFF

There are thirty-two known types of pneumococcus germs responsible for most pneumonias and serums are readily available for treatment of the more common ones. But the type must be known before the right serum can be chosen. To use them effectively a patient must be examined early in the course of the disease. Alkaline methylene blue may be used in the typing of the germs. In New York the following procedure is typical under the "Neufeld Method":

1. Doctor dispatches sample of sputum of the stricken patient to

2. Laboratory, approved by city health authorities, which is known as the typing station. Here flecks of sputum are transferred to slide and mixed with typing sera and alkaline methylene blue. The slide is then covered with cover slips and examined under an oil immersion lens with light partially dimmed. The reaction may be negative (capsule not swollen) or positive (showing swollen capsules in preparation with serum of homologous type).

By this method the germ may be quickly identified and proper treatment arranged.—*Heinrich G. Zimmermann.*

● SOCMA MEETING

A meeting of the Synthetic Organic Chemical Manufacturers Association was held at the Chemists' Club, New York City, on Tuesday, May 11th, at 12:30 P. M. A discussion of current legislative and trade matters took place. The secretary reported that reservations for the outing to be held at Seaview on June 3rd and 4th were coming in very well and that the golf tournament events would be the same as last year.

OPEN FORUM

Rules under which this department of the REPORTER is conducted are as follows:

1. Anyone who has a technical problem on which he would like advice may submit it to the Reporter and it will be published in the first available issue.

2. Any reader who feels that he has a solution of the problem may forward his reply to us and if we feel that the reply is suitable it will be published in a succeeding issue.

3. For each such reply published the Reporter will pay a minimum of $2.

4. In case there is more than one answer to the same question, the one covering the subject in the most complete and authentic manner will be published, or if two answers are sufficiently different both will be published. If two answers are considered equally good, the one first received will be given priority.

5. The Reporter will assume no responsibility whatsoever for the accuracy of the answers submitted—it is simply offering a vehicle for the public expression of its readers' opinions.

6. Both the questioner and answerer must send in his complete name and address. When requested we will publish only the initials or other identifying insignia.

Unanswered Question

41—We would like to know the general principles of the process used in rendering silk transparent. Inasmuch as the process is to be used on rather heavy goods, we believe that one of the newer methods whereby thin layers of fiber have been rendered absolutely transparent is necessary. Information along this line which any of your readers are inclined to give will be highly appreciated.—**Library.**

CLASSIFIED

POSITION WANTED: Chemist capable to take charge or supervise the preparation, dyeing and finishing of rayon, acetates, cross-dyes,—Special experience in crepes—Cotton experience and original research work. Write Box No. 945, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: "Carpet Yarn Dyer" or assistant. Sixteen years' experience on axminster carpet yarns. Married. Dependable. Will go anywhere. Write Box No. 957, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

SALESMAN WANTED: A Progressive Dyestuff Manufacturer has an opening for a salesman. The man we want must have a proven record of achievement and he must be able to bear rigid investigation. The particular man we have in mind has attained an eminent position with his present firm which would satisfy the ordinary man. To such a man we extend an invitation to write, stating all the important facts which he would expect to know if our positions were reversed. All letters will be held in strict confidence. Inquiries will be made after an interview has been concluded, and then only with the consent of the applicant. A salary of $8,000.00 per year plus commission will be paid to the man we select. All members of our organization have been advised of this advertisement. Write Box No. 958, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.